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ABSTRACT

This curriculum guide on consumer education, covering one of the five content areas of the Energy and Family Curriculum Guide, has been designed to provide learning experiences and identify resources that can be used to develop units of study related to energy usage and conservation. The guide is intended for use in comprehensive courses of home economics as well as specialized courses of the home economics subject matter content areas, especially in the state of Texas. The guide contains two units covering the true value of energy and budgeting energy use (lifestyle needs, cost of operating appliances, reading the meter, budgeting utility bills, selection and use of energy-efficient equipment, and energy for transportation). For each major concept, the guide provides a competency statement, terminal performance objectives, as well as concepts and generalizations linked to specific learning experiences and resources. The guide contains three appendixes. Appendix A contains a bibliography of books, pamphlets, multimedia materials, and other teaching aids. Appendix B contains prepared information sheets, games, bulletin board ideas, check sheets, evaluation forms, and transparency masters. Appendix C is a collection of background information that may be helpful to the teacher in using the learning experiences. A glossary completes the curriculum guide. (KC)

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ED236397

ENERGY AND THE FAMILY

CONSUMER EDUCATION CURRICULUM GUIDE

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FOREWORD

The level of energy literacy must be raised in our nation. The citizens of the future need to be more knowledgeable about energy and begin now to make wise decisions for the future use of energy. Home Economics Education programs are designed to teach decision making, value clarification, and identification of resources being used by individuals and families in the homes of our nation.

There are things we can do to help citizens of the future to be more knowledgeable about energy and begin to make wise decisions about use of energy. The Energy and the Family Curriculum Guide has been designed to provide learning experiences and identify resources that can be used to develop units of study related to energy usage and conservation. The guide has been prepared for use in comprehensive courses of Home Economics I and Home Economics, II, as well as specialized courses of the Home Economics subject matter content areas. Materials included in the guide are organized into five content areas of Home Economics:

1. Consumer Education
2. Foods and Nutrition
3. Home Management
4. Housing and Home Furnishings
5. Textiles and Clothing

Competency statements and terminal performance objectives were developed for the broad conceptual areas of study. Generalization statements related to key concepts were written opposite appropriate learning experiences. The domains and levels of learning were considered in developing learning experiences. Suggested resources were referred to and can be found in appendices at the end of each content area section. Appendix A contains a bibliography of books, pamphlets, multimedia materials and other teaching materials. Appendix B has prepared information sheets, games, bulletin board ideas, check sheets, evaluation forms and transparency masters. Appendix C is a collection of background information that may be helpful to the teacher in using the learning experiences.

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ENERGY AND THE FAMILY CURRICULUM

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ACKNOWLEDGEMENTS

SCOPE AND SEQUENCE CHART OF CONCEPTS RELATED TO
ENERGY AND THE FAMILY

HOUSING AND HOME FURNISHINGS

- A. Selection of Energy-Efficient Housing
 - 1. Human needs and values
 - 2. Mobile homes
 - 3. Apartments
 - 4. Townhouses
 - 5. Single-family dwellings
 - 6. New types of energy-efficient housing
 - a. Solar
 - b. Earth
 - c. Homes for the future
- B. Evaluating a Home for Energy Efficiency
 - 1. Heat transfer
 - 2. Air infiltration
 - 3. Building an energy-efficient home
 - a. shape and surface area
 - b. house orientation
 - c. glass area
 - d. landscaping
 - e. choice of heating and cooling alternatives
 - f. kitchen planning
 - 4. Retrofitting Existing Homes
 - a. Ways to retrofit existing homes
 - 1. caulking
 - 2. weatherstripping
 - 3. foam gaskets
 - 4. water heating conservation measures
 - 5. insulation
 - 6. shading devices
 - 7. storm or double-paned windows
 - 8. attic ventilation
 - b. Home energy audit
- C. Maintaining Thermal Comfort through Interior Design
 - 1. Design elements inside and outside the home
 - a. color
 - b. texture
 - c. shape and form
 - 2. Window treatments
 - 3. Furniture arrangement
 - 4. Lighting
 - a. bulbs
 - b. fixtures

FOODS AND NUTRITION

(Home Economics I)

- A. Energy Lifestyles
- B. Energy Management in Food Preparation
 - 1. Use and care of food preparation appliances and equipment
 - 2. Using cookware and bakeware
 - 3. Food cleanup techniques
 - a. Hot water usage
 - b. Handwashing vs. automatic dishwashing
 - c. Disposal of waste

(Home Economics II)

- A. Energy Conservation Practices in Use and Care of Food Preparation Appliances
 - 1. Conservation awareness
 - 2. Conventional ovens and surface units
 - 3. Microwave appliances
 - 4. Small appliances
- B. Planning and Preparing Energy-Efficient Meals
 - 1. Meal Planning
 - 2. Oven meals, one-dish meals
 - 3. Preparation during emergencies
 - 4. Economics of food production and storage

TEXTILES AND CLOTHING

(Home Economics I)

- A. Role of Clothing in Energy Management/Thermal Comfort
 - 1. Effect of design elements on thermal comfort
 - a. Color
 - b. Texture
 - c. Style
 - d. Shape
 - e. Accessories
- B. Energy Management in Clothing Construction
 - 1. Management of energy in equipment use
 - 2. Construction projects
 - a. Draft dodgers
 - b. Warm sack
- C. Personal Care and Energy Use
 - 1. Consumption of energy by grooming appliances
 - 2. Energy management habits

(Home Economics II)

- A. Role of Clothing in Energy Management/Thermal Comfort
 - 1. Fabric selection
 - a. Fiber content
 - b. How fiber is spun
 - c. Properties in relation to thermal comfort
 - 2. Relationship of fabric care to energy use
 - 3. Clothing Selection for Thermal Comfort
 - a. Clo value
 - b. Activities
 - c. Climate
 - d. Accessories
 - 4. Special Clothing Requirements
 - a. Children
 - b. Elderly
 - 5. Recycling Clothing
 - 6. Classic Fashions vs. Fads

CONSUMER EDUCATION

- A. Value of Energy
 - 1. Uses
 - 2. Sources
- B. Budgeting Energy Use
 - 1. Lifestyle needs
 - 2. Cost of operating appliances
 - 3. Reading the meter
 - 4. Budgeting plan
 - 5. Interpreting the utility bill
 - 6. Customer services available for budgeting and financial assistance
 - 7. Selection and use of energy-efficient equipment
 - 8. Energy for transportation

HOME MANAGEMENT

- A. Percentage of Home Energy Use
- B. Energy Usage of Appliances
 - 1. Determining wattage
 - 2. Calculating operating cost
- C. Energy Conservation in Home Activities
 - 1. General conservation practices
 - 2. Major appliances
 - 3. Menu planning
 - 4. Household cleaning appliances
 - 5. Personal care
- D. Managing Transportation
- E. Managing Leisure Time
- F. Managing Existing Resources

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Ms. Marvelle Donaldson
Mrs. Barbara Franklin
Mrs. Sheila Maicez

CONSUMER EDUCATION

MAJOR CONCEPT: Value of Energy

SUGGESTED FOR: Consumer Education Specialized Course

COMPETENCY STATEMENT: Develop an awareness of the energy situation and its effect on our lives.

TERMINAL PERFORMANCE OBJECTIVES: The student will be able to:

Identify five terms related to energy.

Give five examples of how energy is used in our lives.

Analyze present sources of energy.

Identify five future sources of energy.

CONCEPTS AND GENERALIZATIONS

Value of Energy - Use

Individuals are affected by their understanding of energy use and conservation within their households.

Value of Energy - Sources

There are renewable and non-renewable energy sources.

LEARNING EXPERIENCES AND RESOURCES

*Turn off all lights. Use a lighted candle for illumination. Ask students to think about "What would your life be like without energy?"

*Complete handout "What's Your E Q?" See Appendix B, pages 18-20.

Complete word search on energy consumption habits. Also, give a post-test at completion of the unit. See Appendix B, pages 21-25.

*Students participate in Energy Nametag Game. See Appendix B, pages 26-27.

*Complete activity, "Where We Get Our Energy, How We Use It." See Appendix B, pages 28-29.

*Complete activity, "Primary Energy Sources." See Appendix B, pages 30-31.

*Students make Energy Chain and/or puzzle. See Appendix B, pages 32-36.

The supply and cost of present and future energy sources will affect our lives.



View film "A Play Half Written" or "Energy, the Great Search." See Appendix A. Have students write a reaction paper after seeing the films.

*View transparency, "Changes in GSU Fuel Sources to Produce Electricity." See Appendix B, page 37 and Appendix C, page 97.

Construct bulletin board, "Super Earth Can Run Out of Oil," to illustrate the fact that if we continue to use oil as we have in the past, this energy source could be depleted. See Appendix B, page 38.

Complete activity, "Words About Energy" crossword puzzle. See Appendix B, pages 39-44.

MAJOR CONCEPT: Budgeting Energy - Lifestyle Needs

SUGGESTED FOR: Consumer Education Specialized Course

COMPETENCY STATEMENT: Initiate an energy budgeting plan in terms of personal energy requirements.

TERMINAL PERFORMANCE OBJECTIVES: The student will be able to:

Recognize the relationship between lifestyle and energy use to current domestic and world problems.

Estimate the amount of energy consumed by the household.

Set lifestyle priorities based on preferences and needs.

CONCEPTS AND GENERALIZATIONS

Lifestyle Needs

Energy costs will continue to increase rather than decrease.

Lifestyle problems can be related to high energy costs.

LEARNING EXPERIENCES AND RESOURCES

Discuss "Adjusting Our Lives to Stretch Energy." See Home Management, Appendix B, page 103-108.

*View transparency, "Impact of Use & Care on Total Energy Consumption." See Appendix B, page 45.

*Complete "The Baker's Dozen" activity on lifestyles. See Appendix B, page 46.

Participate in activity, "Energy Conservation is..." Pass out E's and C's. Have students write down 10 completion sentences on "Energy Conservation is..." on their letter. Discuss. Take up letters to make into bulletin board entitled "Energy Conservation Is..." These could also be placed on wall. See Appendix B, page 47.



Conduct buzz session to discuss "three things I would do willingly to conserve energy" and "the toughest energy conservation measure for me would be..." Divide class into 3 to 5 people per group. Distribute different colors of paper plates or construction paper, one per group. Appoint a group member to write answers on plates or

Energy use and/or conservation in the home is dependent upon lifestyle needs and desires.

paper. Report decisions back to class.
A mobile could be constructed from the plates or paper.

View transparency, "Per Capita Use of Energy."
See Appendix B, page 48, and Appendix C, page 98.

View transparency, "Population Growth."
See Appendix B, page 49, and Appendix C, page 98.

View transparency, "Growth of U.S. Energy Use and Population." See Appendix B, page 50, and Appendix C, page 98-99.

*Write a reaction paper: You are living in the year 2000. Our energy supply is limited! Your lifestyle will now be... Share with the class.



*Complete "Conservation Questionnaire" as awareness activity. See Appendix B, pages 51-53.

Construct bulletin board on lifestyles.
See Appendix B, page 54.

Complete "Energy Attitude Survey" or "How Do You Feel About Energy?" See Appendix B, pages 55-56.

MAJOR CONCEPT: Budgeting Energy - Cost of Operating Appliances

SUGGESTED FOR: Consumer Education Specialized Course

COMPETENCY STATEMENT: Compare the amount of energy consumed by various appliances and equipment in order to devise an energy budgeting plan.

TERMINAL PERFORMANCE OBJECTIVES: The student will be able to:

Calculate costs of operating appliances.

Define terms relating to cost of operating appliances.

CONCEPTS AND GENERALIZATIONS

Cost of Operating Appliances

The cost of operating appliances and equipment is a key factor in planning an energy budget.

LEARNING EXPERIENCES AND RESOURCES

*View transparency, "Average Annual Energy Use by Appliance," to discover percentage of energy used in an average home. See Home Management, Appendix B, page 30.

*Distribute handouts or view transparencies to discuss electrical terms relating to calculating costs of operating appliances and steps for calculating operating costs. Calculate costs of operating appliances. See Home Management, Appendix B, pages 29-30, 38-39.

Brainstorm about energy and money saving tips for the home. Have students list tips under the following categories: Heating and Cooling, Water Heating, Refrigeration, Food Preparation, and Other. Distribute "Energy and Money Saving Tips" and discuss tips not mentioned. See Home Management, Family Energy Tips For The Home, Appendix B, beginning on page 53.

Complete handout, "Energy Choices." See Home Management, Appendix B, pages 20-22.



Play "You-The Energy Game" for awareness of basic energy conservation facts. Game boards may be ordered from Gulf States Utilities, Marketing and Consumer Services Department.

MAJOR CONCEPT: Budgeting Energy - Reading The Meter, Budgeting Plan, Interpreting the Utility Bill.

SUGGESTED FOR: Consumer Education Specialized Course

COMPETENCY STATEMENT: Read the electric meter and determine how various appliances affect kilowatthour consumption.

TERMINAL PERFORMANCE OBJECTIVES: The student will be able to:

Locate and read the electric meter in the home.

Record a meter reading and calculate the cost of electrical usage for one week.

Identify appliances that require high energy consumption for operation.

Read and interpret charges incurred on an electric utility bill.

Analyze factors affecting variation of the utility bill.

Set up an energy budgeting plan.

Summarize the special assistance programs made available by most utility companies.

CONCEPTS AND GENERALIZATIONS

Meter Reading

The key to successful budgeting is your utility meter and knowing what appliances and equipment really make it turn.

After determining how many kilowatthours are being used during a designated interval, energy use can be evaluated, and steps taken to reduce energy usage.

Budgeting Plan

LEARNING EXPERIENCES AND RESOURCES

*Wattage, meter, kilowatthour, natural gas, electric meter, degree day. Become familiar with energy terms and the location of the meter at home. Refer to Glossary.

View transparency and use handout to explain procedure for reading a meter. See Appendix B, page 58.

Complete activities to reinforce skills in meter reading. Take necessary steps to isolate appliances with high energy consumption. See Appendix B, pages 60-63.

Display bulletin boards "Read Your Meter, Your Key to Energy Budgeting," "Meter Reading." See Appendix B, page 64.

Construct bulletin board using energy budgeting ideas. See Appendix B, pages 65-68.

The energy budgeting plan can help control the percentage of income spent for housing and transportation.

The process of energy budgeting involves selecting the amount of money you are willing to spend monthly, followed by monitoring your consumption to stay within your budget.



Prepare an energy budgeting plan for 1 month. Execute plan and evaluate results.

Invite a GSU Marketing and Consumer Services person to speak on "Budgeting Your Energy Use."

Interpreting the Electric Utility Bill

Interpreting the electric utility bill will enable students to establish priorities for the use and conservation of energy.

Reasons for variations on the electric bill include changes in normal living conditions and appliance and equipment.

*Discuss terms needed for understanding the utility bill, such as: fuel adjustment, billing period, kilowatthour, electric meter, present and previous reading, estimated reading, billing period. See Glossary.

*Discuss case study activity, "Understanding the Utility Bill." View transparencies to explain parts of the utility bill, causes of bill variations, the monthly rate, and how Mr. Doe's bill is figured, as case is discussed. See Appendix B, pages 69-73. Complete problems from case study activity, "Understanding The Utility Bill." See Appendix B, pages 74-75.



Invite a utility representative to explain the utility bill. Have students bring a utility bill from home. Study information and listen to explanation of fuel adjustment costs and other charges that might appear on the electric bill.

Special Assistance Programs

Services are available to customers in financial need most utility companies.



Discuss handouts on customer helps that are available. See Appendix B, pages 76-77.

Invite a GSU Marketing and Consumer Services person to explain the 'customer helps' that are available through a utility. If this is not possible, teacher should ask 4 outstanding students to prepare reports and present orally to the other class members. Class members

might possibly know of someone who has benefitted from these helps. Obtain a copy of the "Helps Available" booklet to find out what services are available for persons on low or fixed incomes. (Organize a project to inform Senior Citizens of 'customer helps.')

Ask students whose parents might be on the Equal Payment Plan to bring in bills and possibly comments from parents as to the Pros and Cons of this method of paying the electric bill.

MAJOR CONCEPT: Budgeting Energy - EnergyGuide Labels

SUGGESTED FOR: Consumer Education Specialized Course

COMPETENCY STATEMENT: Recognize the importance of using the EnergyGuide label information and comparison shopping skills when purchasing appliances.

TERMINAL PERFORMANCE OBJECTIVES: The student will be able to:

Determine operating costs based on EnergyGuide labels.

Identify preferences and needs.

Compare prices and features of different brands and models of appliances.

Realize the value of comparison shopping.

CONCEPTS AND GENERALIZATIONS

EnergyGuide Label

The EnergyGuide Label enables consumers to purchase appliances that are more energy efficient and cost less to operate.

The EnergyGuide Label shows the appliances energy cost and compares it to the energy cost of similar models.

The way a person chooses and uses and appliance affects the amount of household energy consumed.

When shopping, the consumer should decide what features are needed and then consider the initial price and the operating cost of the appliance.

Energy-efficient appliances will cost less to operate over the life of the appliance, although the initial

LEARNING EXPERIENCES AND RESOURCES

*View program on, "The EnergyGuide Label," presented by GSU Marketing and Consumer Service educational person or slide presentation available on loan from GSU. See Appendix A.

View transparencies and explain the three basic kinds of EnergyGuide labels on buying energy-efficient appliances and and equipment. See Appendix B, pages 81-83.

Play game, "It's Your Money - It's Your Choice," Home EnergyGuide Game Board. See Appendix A. Divide students into groups. Choose a captain to ask questions and keep score as answers are given by the group. Compare with other groups. Possibly the teacher could award a small prize for highest score.

Assist students in recognizing needs and preferences through comparison shopping activity using catalogs from major mail order companies, or catalog specifications from appliance manufacturers.

Invite a sales representative from a major

purchase price may be somewhat higher.

An appliance's cost includes both its initial cost (what one pays at the store) and its operating cost (what one pays to run it). This is called the "total cost" or "life cycle cost."

appliance company or visit an appliance store to inform students of features of various models of appliances and operating costs of each.

Compute cost savings of Refrigerator/Freezer, with activity "Using EnergyGuide Labels for Comparison Shopping." See Appendix B, pages 84-88.

Develop a bulletin board "Choices! Choices! What Will It Be?" or "The Price is Right Or Is It?" with cut-outs of various appliances using a collage effect.

Read textbook: Guide to Modern Meals, pages 211-212.

View filmstrip: "Energy Management - A Guide to Saving Energy and Money at Home." See Appendix A.

MAJOR CONCEPT: Budgeting Energy - Transportation

SUGGESTED FOR: Consumer Education Specialized Course

COMPETENCY STATEMENT: The students will be able to apply energy conservation alternative practices in transportation.

TERMINAL PERFORMANCE OBJECTIVES: The student will be able to:

Compute miles per gallon of gasoline.

Evaluate transportation.

Compare necessary use of individuals and families.

Give examples of alternatives to private operation of vehicle.

Employ energy-efficient driving practices.

CONCEPTS AND GENERALIZATIONS

Cost of Operating Vehicle

Operating costs are directly related to how many miles you drive, how you drive, where you drive and the amount and frequency of maintenance and repairs.

Alternatives in Transportation

There are both advantages and disadvantages in carpooling and public mass transportation.

Energy-Efficient Operation

Driving techniques of the individual behind the wheel are the most important single element in determining the fuel economy of any car.

LEARNING EXPERIENCES AND RESOURCES

Read Chapter 13, pages 209-216, Living Today. See Appendix A.

*Complete activities "Computing Miles Per Gallon," "Recording Forms," and "Computation Forms." Students will follow through activities as suggested. See Appendix B, page 89-91.

*Have students keep information on individual and family use of the automobile for a one week period using "Trip Log." Use it to compare with others in the class. See Appendix B, page 92.

*Compute cost of carpooling versus riding alone. See Appendix B, p. 93.

Collect ideas and prepare bulletin boards employing "Energy-Efficient Driving Practices." See Appendix B, pages 94-96.

Sponsor "Walk to School Day" as an FHA



project. Give a prize to the student who walks the greatest distance. Calculate amount of fuel saved and post or announce to the student body.

Role play show family activities would be changed if the car could be used only one time a week by the family.

Have students plan a vacation using a road map. Include charting route, compute gasoline and lodging costs. Also include activities that could be done while on vacation that would conserve energy, such as bicycling or hiking. Perhaps families would entertain going together to save even more fuel.

*Review "Family Energy Saving Tips for Transportation." See Appendix B, pages 94-96.



Plan a school-wide "Energy Awareness Day." As an FHA activity, prepare a poster board for main entrance hallway asking students to participate in conserving energy for one day by walking to school, eating a cold cereal breakfast, air-drying their hair, etc. After participation, students would then list changes in lifestyle that were made as a result.



Run public service energy conservation "spots" on local radio or TV in conjunction with Energy Awareness Day. Students could write these and possibly do the announcing.

APPENDIX A
REFERENCES
CONSUMER EDUCATION

Appendix A
References - Consumer Education

Books

Ohl, Suzanne, Duyff, R., and Hasler, D. Guide to Modern Meals.
Webster Division/McGraw Hill Book Company, New York, 1981.

Oppenheim, Irene. Living Today. Bennett Publishing Company, Peoria,
Illinois, 1981.

Multimedia Teaching Materials

16 mm films available from Region V Education Service Center:

"Energy: The Great Search," 1972, 13 min., #4984.

"Energy: 2000," 1977, 18 min., #7443.

Gulf States Utilities:

"The EnergyGuide Label," #19, slide presentation.

"A Play Half-Written," 16 mm #6, 25 min.

The Learning Seed Co., 21250 Andover, Kildeer, Illinois 60047:

"Energy Management - A Guide to Saving Energy and Money at Home,"
filmstrip.

National Film Distributors, 117 Valley Road, Richardson Park,
Wilmington, Delaware 19804:

"Family: Lifestyles of the Future," 22 min.

Pamphlets

Gulf States Utilities:

"Energy Efficiency Ratio"

"You Can Budget Your Energy Costs"

"Watts Going On"

Request listing of Energy Curriculum Materials from: Department of Energy
Technical Information Center, P. O. Box 62, Oak Ridge, Tennessee 37830.

"The Three E's, Energy/Ecology/Economics," Pamphlet #ER53, Sears Roebuck and
Co., Consumer Information Services, Sears Tower, Chicago, Illinois 60684.

"Tips for Energy Savers," Federal Energy Administration, Washington, DC 20461.

Teaching Materials

It's Your Money. Game Board can be ordered from U.S. Department of Energy, Washington, DC 20545.

"You - The Energy Game," Carilyn K. Norris, Associate Professor, Vocational Home Economics Education, Colorado State University. (Available from Gulf States Utilities).

"Case of the Missing Kilowatt," Deborah Singer, Coordinator, Consumer Education Services, Montana Power Company, 40 East Broadway, Butte, Montana 59701.

Energy Conservation Lesson Plans, Dallas Power and Light, Dallas, Texas.

"The Energy Crisis," Unigraph, 1428 Harvard Avenue, P.O. Box 24287, Seattle, Washington 98124. (52 reproducible activities by Leavitt, plus Leavitt guide).

Energy and Ecology - Are You Involved?, Public Education Association, 20 West 40th Street, New York, New York 10018.

Inflation... "Why Everything Costs More," Comic book from Marketing and Consumer Services Department - Gulf States Utilities.

Introduction to Energy, Wisconsin Vocational Studies Center, University of Wisconsin, Madison, Wisconsin.

"It's Your Money - It's Your Choice," Home Energy Guide, U.S. Department of Energy, Washington, DC 20545.

Iowa Developed Energy Activity Sampler, Iowa Energy Policy, Iowa Department of Public Instruction, Journal Of Home Economics, Winter 1979.

"Stop the Energy Thief," FHA/HERO Project, Alabama Association, Future Homemakers of America.

APPENDIX B
TEACHING MATERIALS
CONSUMER EDUCATION

WHAT'S YOUR E.Q.?

How much do you know about energy? What's your Energy Quotient? To find out, read each statement. Find its correct answer. Then write the number of the answer in the box following the statement.

- A. Slows the movement of heat. ☐
- B. Recommended home temperature in winter. ☐
- C. Open and close it quickly. ☐
- D. A quick shower uses _____ the water of a normal bath. ☐
- E. Put it around windows and doors. ☐
- F. Lower water heater temperature to _____. ☐
- G. Reflective film can block out approx. _____ of the heat from the sun. ☐
- H. Look for it on an air conditioner. ☐
- I. What every cooking pan needs on top. ☐
- J. Heat Pump ☐
- K. Using the range oven for a heater or toaster is a _____ use of energy. ☐
- L. Should be flat-bottomed. ☐
- M. Air condition at _____. ☐
- N. Clean it after each dryer load. ☐
- O. Solid-state appliances use _____ energy than tube types. ☐

P. Vent it to the outside.

☐

Q. Heating and cooling system _____ should be cleaned
or replaced every 30 days.

☐

R. Fluorescent lights are at least _____ times more
efficient than incandescent lights.

☐

S. Clothes washers and dishwashers are most efficient when
washing _____ loads.

☐

T. Small appliances are _____ users of energy.

☐

Source: "Stop the Energy Thief," Alabama Association
Future Homemakers of America, FHA Hero Project.

ANSWERS:

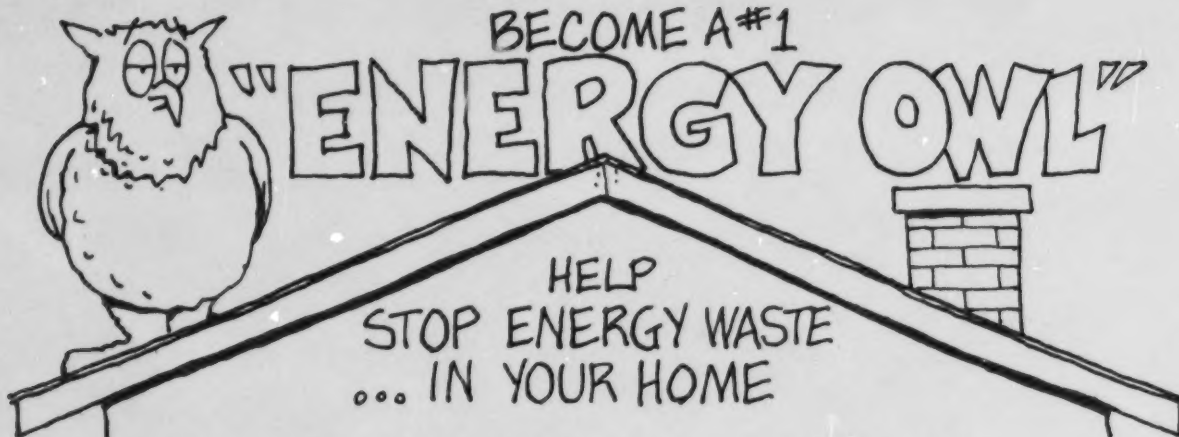
- | | | | |
|------------------|--|--------------------------|----------------------|
| 1. Clothes dryer | 10. 66° | 17. 170° | 24. Efficient |
| 2. Lint zephyr | 11. 68° | 18. 120-140° | 25. 78°
or higher |
| 3. 75 percent | 12. A high EER | 19. Lint filter | 26. Less |
| 4. Pots & Pans | 13. Plastic | 20. Wise | 27. Caulking |
| 5. Insulation | 14. 1/32 inch | 21. Filters | 28. Rotors |
| 6. More | 15. A tight-
fitting
lid | 22. Full | 29. Half |
| 7. Wasteful | | 23. Refrigerator
door | 30. One-third |
| 8. 75° | 16. 200 percent
heating
efficiency | | |
| 9. 4 | | | |

TEACHER'S ANSWER SHEET

Statement letter	Correct Answer	Statement letter	Correct Answer
A.	5--Insulation	K.	7--Wasteful
B.	11--68 degrees	L.	4--Pots & Pans
C.	23--Refrigerator door	M.	25--78°or higher
D.	29--Half	N.	19--Lint filter
E.	27--Caulking	O.	26--Less
F.	18--120-140°	P.	1--Clothes dryer
G.	3--75 percent	Q.	21--Filters
H.	12--A high EER	R.	9--4
I.	15--A tight-fitting lid	S.	22--Full
J.	16--200 percent heating efficiency	T.	24--Efficient

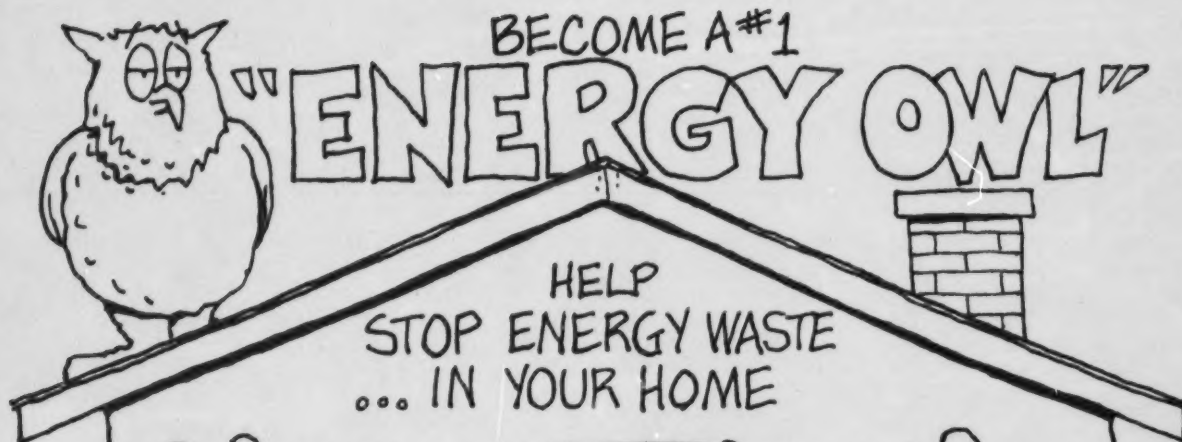
SCORING:

- 20, 19, 18 correct answers -- Energy Conservor, First Class
17, 16, 15 correct answers -- Energy Conservor, Second Class
14, 13, 12 correct answers -- Energy Conservor, Third Class
11, 10, 9 correct answers -- Energy Conservor, Fourth Class
Below 9 -- Go back to basic training



WOINTECERTZIPHEATERSAVEIQPAN
 SANIPAONMORFREEZERCOUSERVEEO
 NLSUXTNOMILKSAVEUSOWIMELYVEI
 FOUHLOS BETTERTOLIANMOMMCOILS
 OFLUELEWENTLOPIENVTEMALEOVNI
 LLAUARRCALVTAUNCQEUNOVTUREIV
 DUTAKEVREROIDMTTUCREZTSLIVUE
 XNIPENERGYMVAPOFLUORESCENTAL
 AOODSNOWAVEBOARIEAVREAVNLORE
 URNAPPLIANCESUNCTLEESDEEROST
 CDULLODEZIGERALATONFONSRKOOC
 ERDUAWIVIFAUCETSOZARTGRGUTIO
 TYFOMESHAVEOVSSSECNVILGGYTSTN
 SEPIPRHETESHOWERSTOGGEYORENE
 IREZSAWRDSUMOREGRENEVYUWETHE
 NMOUQSAHNTSOSTNECSEROGLLAVOR
 KIPCHESATEZSAVEFUELALRXITSFV
 ITLOTWHEOSAWVNMONEYTTEUYGOFE
 TGEAUCETHERMOSTATOUOONWIZHOT
 EONTOURSATEORUCONSERVEUCENTS
 DOORS DHIVELECTRICITYUWINDOWS

Source: "Stop The Energy Thief," Alabama Association
 Future Homemakers of America FHA Hero Project



WO INTECERTZIPHEATERSAVEIQPAN
 SANIPAONMORFREEZERCOUSERVEEO
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 SEPIPRHETESHOWERSTOGGEYORENE
 IREZSAWRDSUMOREGRENEVYUWETHE
 NMOUQSAHNTSOSTNECSEROGLAVOR
 KIPCHESATEZSAVEFUELALRXITSFV
 ITLOTWHEOSAWVMONEYTTTEUYGOFE
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 EONTOURSATEORUCONSERVEUCENTS
 DOORS DHIVELECTRICITYUWINDOWS

Source: "Stop The Energy Thief," Alabama Association
 Future Homemakers of America FHA Hero Project

Here are ways you can help . . . SAVE AMERICA'S ENERGY.

Check the capitalized words in the "wise ways to save energy" messages below and find them in the letters on the puzzle, as per example. The words sometimes read forward, at other times backwards, up, down, or even diagonally.

You get 5 points for each word located. A perfect score is 100, but also find the words ENERGY OWL and You're "No. 1."

WISE WAYS TO SAVE ENERGY

The HEAT PUMP is most economical for heating and cooling.

Install storm WINDOWS and doors.

Flip off LIGHTS when not in use.

Keep WATER heater no higher than 140°.

Repair leaky FAUCETS.

Wash only full loads in clothes WASHER.

Use WARM water for washing.

Use FLUORESCENT lamps where possible.

INSULATION is measured in terms of resistance to heat flow-R value.

Set THERMOSTAT at 68° or less in winter.

Use small APPLIANCES instead of range.

Close door of REFRIGERATOR quickly.

Use correct size LAMPS.

Turn off TELEVISION when not in use.

Locate water HEATER near point of greatest use.

Run full loads in DISHWASHER.

Keep thermostat no lower than 78° in SUMMER.

Insulate water heater and hot water PIPES.

COOK complete meals in oven.

Keep FREEZER full.

To CONSERVE ENERGY and SAVE DOLLARS, help your parents follow these rules in your home and become . . . a "No. 1 Energy Owl."

OCAG
 OCSPENBT
 GAATUVMGKTNE
 WOYTICIRTCELERBS
 CECGNILOOCAGLSNT
 ODBATHROOMDGAATUVB
 INOITAVRESNOCBECNE
 MTPGLVHALFMCVLECLOLE
 AAHWFIREPLACEPLUEISR
 RRLOYSSSTORMREFNSAATLCL
 CEUMGKTNECSEROULFRANIP
 HTSENBTSNOITCEVNOCCLMAR
 YNSIZDOSPRYIPUMPHURO
 RIRKERLDEPLETABLESGU
 QOOHEATINGOIPLOONE
 STOPETROLEUMJILUIL
 OCSPILOTTLESSANKQ
 MTTUONWORBDRMUGS
 HROOMDILOTCS
 CECGNILO
 DBAT

Adapted from: Forecast, Dec., 1978.

Energy Search

1. _____, coupled with emphasis on developing new energy resources offers the most reasonable approach to the energy problem. (12)
2. _____ is a more costly form of energy that we need to conserve. (11)
3. Almost 20 percent of all energy consumed in the United States is used in our _____. (5)
4. Fossil fuels include oil, natural gas and _____. (4)
5. The primary source of energy that meets the greatest percent of the U.S. demand is _____ (crude oil). (9)
6. Almost one _____ of the crude oil used in this country is imported. (4)
7. _____ energy can help conserve our natural resources, but the construction of such plants has been slowed due to environmental objections. (7)
8. _____ energy (based on energy from the sun) doesn't pollute, offers free BTUs but is not yet an economically practical source for heating our homes. (5)
9. In the home, the greatest amount of energy is used for _____ and _____. (7,7)
10. _____ and refrigeration appliances are the third largest users of household energy. (7)
11. The deliberate decrease of voltage (power) supplied by electric companies when demand for power exceeds generating capacity causes a _____. (8)
12. Energy guide _____ on some appliances provide information such as estimated average cost plus cost for comparable products. (6)
13. Gas ranges with _____ ignition can cut energy use up to 30 percent. (9)
14. Small _____ driven appliances do not use a lot of energy. (5)
15. _____ ovens use forced hot air and cook more quickly than conventional ovens. (10)
16. _____ lights are about four times more efficient than incandescent bulbs and last about 7 times longer. (11)
17. _____ is an indication of how efficiently an appliance uses energy (This rating has been used on air conditioning labels. (3))
18. A heat _____ can extract heat from the outside winter air and deliver it to the inside. It can also work in reverse as a standard air conditioner. (4)
19. _____ can provide added insulation for windows and help control solar heat and glare in every season and climate. (10)
20. Proper _____ can reduce the workload of heating and cooling equipment by as much as 20 to 30 percent. (10)
21. _____ stripping all doors and windows so they fit snugly in their frames can save energy by reducing the rate of air infiltration. (7)
22. _____ windows create an air space between themselves and the existing window and can trap half normally passes through windows. (5)
23. The room that uses the greatest percent of the water in the home is the _____. (8)
24. Leaking _____ wastes a lot of water. One drop per second adds up to 700 gallons a year. (7)

KEY

ENERGY: 1. conservation, 2. electricity, 3. homes, 4. coal, 5. petroleum,
6. half 7. nuclear, 8. solar, 9. heating, cooling, 10. cooking, 11. brownout,
12. labels, 13. pilotless, 14. motor, 15. convection, 16. fluorescent, 17. EER,
18. pump, 19. depletable, 20. insulation, 21. weather, 22. storm, 23. bathroom,
24. faucets.

O C A G
 O C S P E N B T
 G A A T U V M G K T N E
 W O Y T I C I R T C E L E R B S
 C E C G N I L O O C A G L S N T
 O D B A T H R O O M D G A A T U V B
 I N O I T A V R E S N O C B E C N E
 M T P G L V H A L F M C V L E C L O L E
 A A H W F I R E P L A C E P L U E I S R
 R R L O Y S S T O R M R E F N S A A T L C L
 C E U M G K T N E C S E R O U L E R A N I P
 H T S E N B T S N O I T C E V N O C L M A R
 Y N S I Z D O S P R Y I P U M P H U R O
 R I R K E R L D E P L E T A B L E S G U
 Q O O H E A T I N G O I P L O O N E
 S T O P E T R O L E U M J I L U I L
 O C S P I L O T L E S S A N K Q
 M T T U O N W O R D D R M U G S
 H R O O M D I L O T C S
 C E C G N I L O
 D B A T

Adapted from: Forecast, Dec., 1978

ENERGY NAMETAG

MATERIALS NEEDED: Easel paper, 4 sheets
Straight pins
Paper
Scotch tape
Energy Name Tags
Pencils
Large felt pen

PROCEDURE:

1. Cut the name tags into individual name tags. Each name tag has a picture of a type of energy on it, and for every energy type there should be 2 name tags.
2. As the group enters the room, give each person a name tag, making sure that two of each kind of name tag are passed out. For example, there should be 2 people with an oil tag, 2 with a coal tag, 2 with a wood tag, etc. (If there isn't an even number of people, draw a picture of one of the types already passed out and have 3 in a group.) Have each person write their name on it and pin it on.
3. Have each person find their energy name tag twin and have them work together and identify 4 things:
 - a. What is energy?
 - b. What is the energy source on their name tag?
 - c. What is something that uses energy?
 - d. What is something that doesn't use energy?
4. While the groups are in discussion, the teacher should title 4 sheets of easel paper with these headings: Energy Is, Energy Sources, Energy Users, Non-Energy Users and tape the sheets up.
5. When everyone's finished, have each energy pair share their information. As each pair relates their discussion, have volunteers, each group or the leader write the findings on the appropriately marked easel paper.

DISCUSSION OF THE MAIN IDEA:

Working off the 4 easel sheets, discuss the following ideas:

- a. What is energy?--Energy is the ability to work. Everytime we do any kind of work we use energy. Energy makes things work. Energy produces heat, light and power.
- b. Energy comes in many forms, and it can change from one form to the other. The sun is our primary source of energy. Without sunlight to deliver energy to the earth, our planet would be frozen and without life.
- c&d. Energy is all around use. Everything uses some form of energy. Energy is very much a part of our everyday lives.

NAME



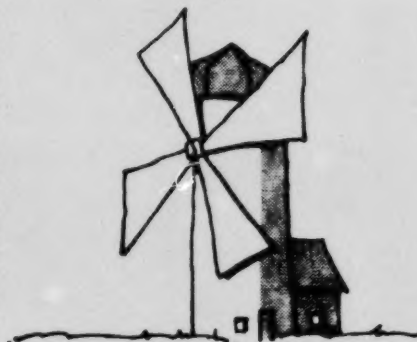
OIL

NAME



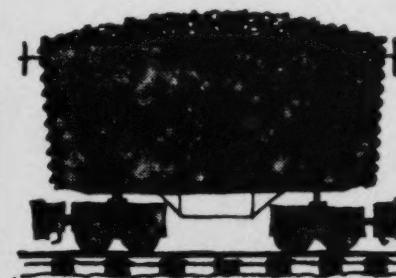
NATURAL GAS

NAME



WINDMILL

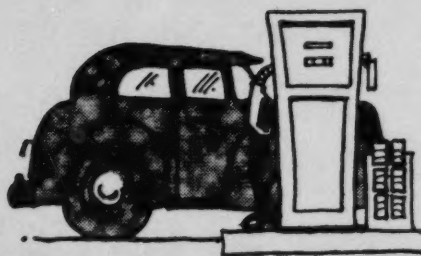
NAME



COAL

27

NAME



GASOLINE

NAME



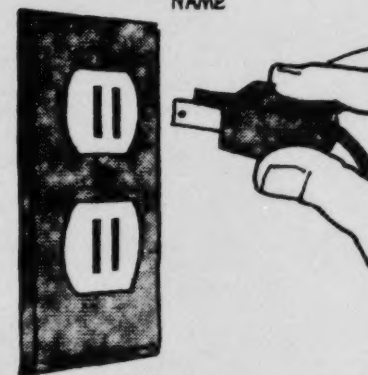
SUN

NAME



WOOD

NAME

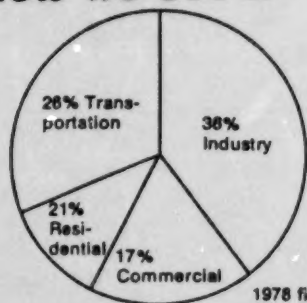


ELECTRICITY

37

36

How We Use It



GRAPH A

Graph A divides our energy use into four groups. In what group do we use the most energy? _____

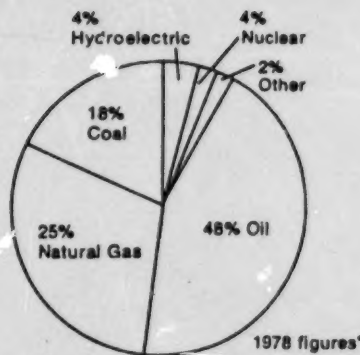
What ranks second? _____

In what ways do you use energy in each of these two groups? What group(s) gives you the most opportunity to cut down on your energy consumption?

Which groups use energy when you do each of the following? Check the box or boxes in the appropriate columns. (The first one is done for you.)

1. Take a hot bath
2. Drive to a hamburger stand
3. Fly in an airplane
4. Switch on air-conditioning
5. Buy a new baseball
6. Ride a school bus
7. Blow dry your hair at home
8. Buy a frozen pizza
9. Ride a motor-bike
10. Manufacture a motor-bike

	Residential	Commercial	Transportation	Industry



GRAPH B

Graph B shows five primary sources of energy. These five sources supply Americans with most of their energy needs. They light and heat the buildings in which we live, work and play. They fuel our vehicles. They run the machines that work for us and manufacture and process the goods we use and the foods we eat. Look at Graph B and answer these questions.

*Numbers may not total 100% because of rounding.

1. What energy source do we use most?

2. Which do we use mostly for heating our homes?

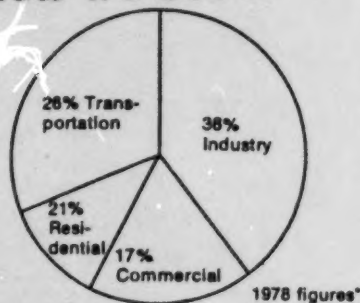
3. What energy source provides most of the fuel for our transportation?

4. Which one makes most of our electricity?

5. What is a possible reason why we use so little hydroelectric energy?

6. Why is electricity not shown on this chart?

Where We Get Our Energy How We Use It



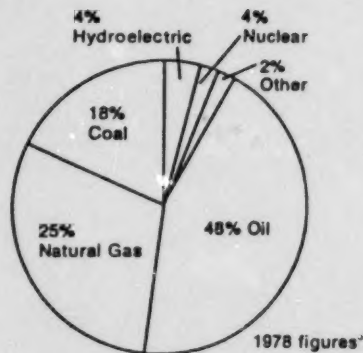
GRAPH A

Graph A divides our energy use into four groups. In what group do we use the most energy? INDUSTRY
What ranks second? TRANSPORTATION
In what ways do you use energy in each of these two groups? What group(s) gives you the most opportunity to cut down on your energy consumption?
Which groups use energy when you do each of the following. Check the box or boxes in the appropriate columns. (The first one is done for you.)

NOTE: EVERY ITEM THAT INCLUDES A PRODUCT COULD ALSO BE CHECKED UNDER 'INDUSTRY.'

- Take a hot bath
- Drive to a hamburger stand
- Fly in an airplane
- Switch on air-conditioning
- Buy a new baseball
- Ride a school bus
- Blow dry your hair at home
- Buy a frozen pizza
- Ride a motor-bike
- Manufacture a motor-bike

	Residential	Commercial	Transportation	Industry
1. Take a hot bath	✓			
2. Drive to a hamburger stand			✓	
3. Fly in an airplane			✓	
4. Switch on air-conditioning	✓			
5. Buy a new baseball				✓
6. Ride a school bus			✓	
7. Blow dry your hair at home	✓			
8. Buy a frozen pizza		✓		
9. Ride a motor-bike			✓	
10. Manufacture a motor-bike				✓



GRAPH B

Graph B shows five primary sources of energy. These five sources supply Americans with most of their energy needs. They light and heat the buildings in which we live, work and play. They fuel our vehicles. They run the machines that work for us and manufacture and process the goods we use and the foods we eat. Look at Graph B and answer these questions.
*Numbers may not total 100% because of rounding.

1. What energy source do we use most?
OIL

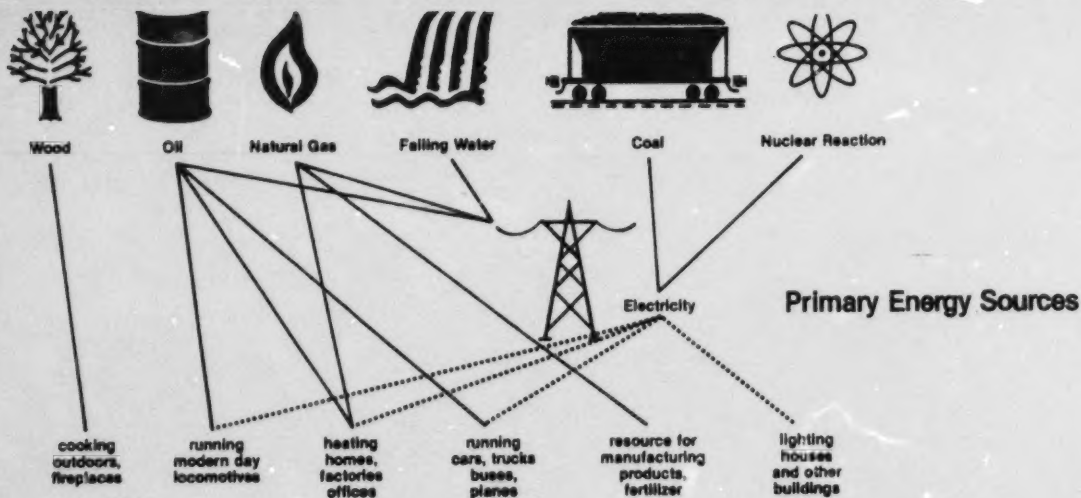
2. Which do we use mostly for heating our homes?
NATURAL GAS

3. What energy source provides most of the fuel for our transportation?
OIL

4. Which one makes most of our electricity?
COAL

5. What is a possible reason why we use so little hydroelectric energy?
NOT VERY MUCH FALLING WATER

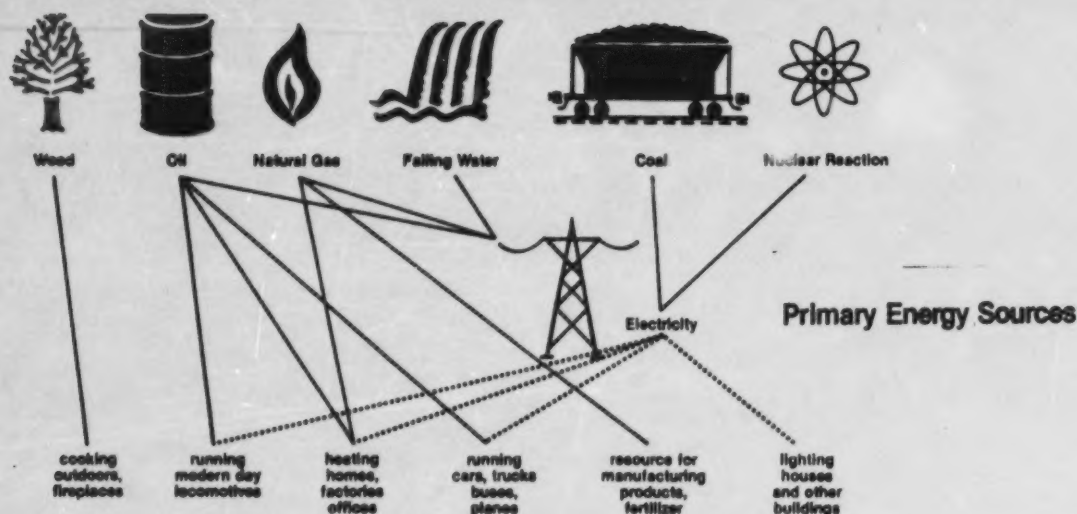
6. Why is electricity not shown on this chart?
IT IS NOT A PRIMARY SOURCE



The diagram above shows six primary sources of energy. Lines connect each primary energy source to the most important work it does. Which energy source is seldom used today? Which two do not involve burning to produce power? Which ones are used to make electricity?

Use the information on the chart to help you complete these four stories about the Spritz Family.

1. In 1901, Great-grandma and Great-grandpa Spritz went by train to Niagara Falls for their honeymoon. The train engine burned coal to boil the water that made the steam that drove it. The primary source of energy was coal. Not long ago their great-grandchildren flew by jet to California. The primary energy source that got them there was oil.
2. Great-grandpa Spritz was one of the first in town to drive an automobile. His Model T burned gasoline. The primary source of this fuel is oil. A Spritz great-grandson earns his living driving a big diesel truck. The primary source of this fuel is oil.
3. Four generations of Spritzes have lived in the old family home. At the turn of the century, the family huddled around a stove in the parlor for warmth. Probably the primary energy source was wood. In 1928 the family put in central heating by installing a furnace in the basement. The primary energy source was coal. Since 1952 the Spritzes, like most Americans have heated their homes with a primary energy source that is clean and convenient to use. It is natural gas.
4. Recently a young Spritz asked how the electricity that lights the house and runs the appliances is made. His dad drew a picture of a giant wheel with blades. "This is a turbine," he said. "There are a number of these at our city's power plant. These giant wheels turn to make electric energy. Falling water or powerful blasts of steam turn the wheels. You can't get steam, of course, without boiling water. And so a primary energy source furnishes heat to boil the water." The primary energy source that makes most of our electricity is coal. Other sources might be gas or oil or nuclear.



The diagram above shows six primary sources of energy. Lines connect each primary energy source to the most important work it does. Which energy source is seldom used today? Which two do not involve burning to produce power? Which ones are used to make electricity?

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THE ENERGY CHAIN

MATERIALS NEEDED: String
Construction Paper
Colored Pens or Crayons
Scotch Tape
Hangers (optional)
Scissors
Easel paper, 1 sheet

PROCEDURE:

1. Point out that the group has already learned that there are many forms of energy, that the sun is our main form of energy, and that energy can change from one form to another.
2. Explain that now they're going to make an energy mobile and find out what kind of energy changes into another kind of energy. In other words, what is the energy chain.
3. Working with the sheet of easel paper marked "Energy Sources" used in the 1st Activity, write down all the rest of the energy sources shown in the attached energy chain mobile. Make sure to cross electricity off the "Energy Sources" list and ask the group after the activity if they know how electricity fits into the chain. The "Energy Source" list should include: sun, earth, plants, wind, water, uranium ore, geothermal, dinosaurs, waves, waterfall, wood, nuclear power, coal, natural gas, oil, gasoline, food, physical power and animal power and garbage (or, if you prefer, have this list made up ahead of time).
4. While writing, explain a little bit about each energy type using the attached energy source definitions. For example, the wind is caused by the sun warming the air, the air rises and keeps moving and this causes wind. Pass out a copy of these definitions to each person so they can have a copy to follow as you define the sources.
5. After explaining the energy components of the mobile, break the group into two smaller groups and pass out the attached energy chain puzzle pieces. Cut the pages into individual pieces first. Working with their definitions, ask the group to see if they can figure out what the energy chain order is for these energy sources. Have them see if they can put the energy pieces together in an energy mobile that's in the order of an energy chain.
6. After a few minutes see if anyone has come up with the chain. Discuss what the energy chain is and show them the example of the energy chain mobile. Have them make their own energy mobile chain using their own design and assembling it in energy chain order, if time permits. (See

attached energy mobile examples.) Ask the group if they know where electricity comes from and how it fits into the chain. Electricity can be made from all the fossil fuels, water power, nuclear power, the wind and the sun. Most of our electrical power comes from coal and hydroelectricity.

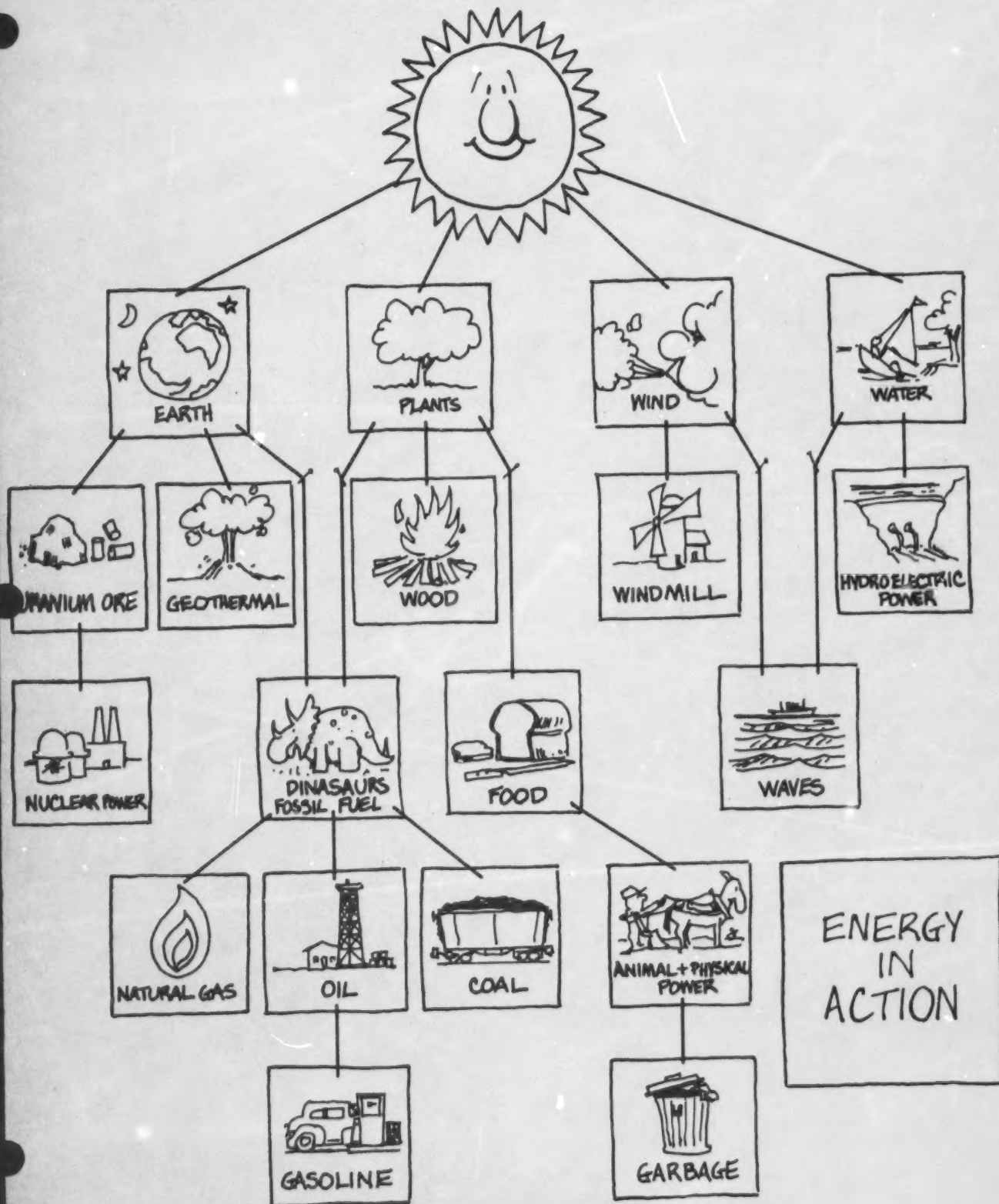
7. Collect the energy chain pieces and definitions for use with a future "What Is Energy?" unit.

DISCUSSION OF MAIN IDEA:

- Energy is always changing form.
- It takes energy to give us energy.
- It takes energy to get all of our energy users.
- It takes energy to make our energy users work.

OPTION: Instead of making an energy mobile, take a field trip to a local power plant after the energy chain discussion.

ENERGY CHAIN BULLETIN BOARD

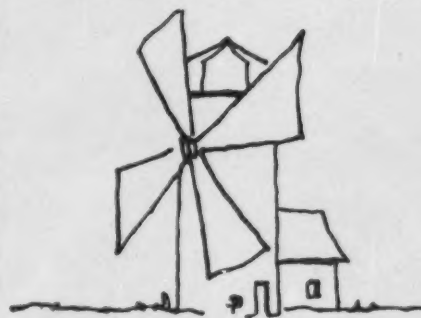




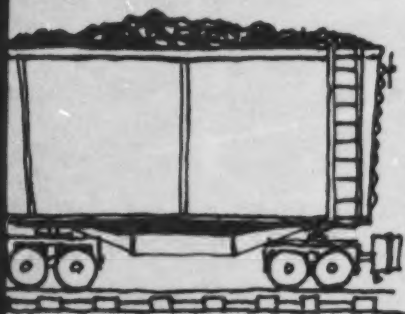
OIL



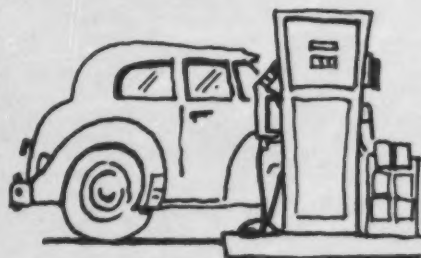
NATURAL GAS



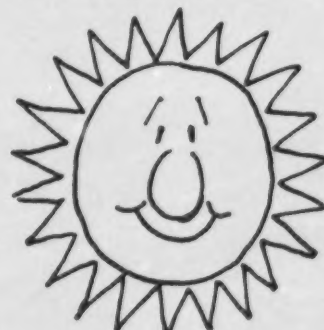
WINDMILL



COAL



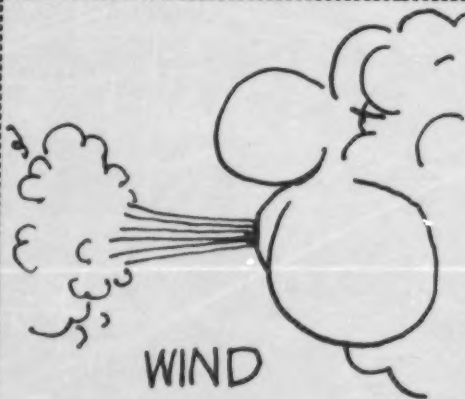
GASOLINE



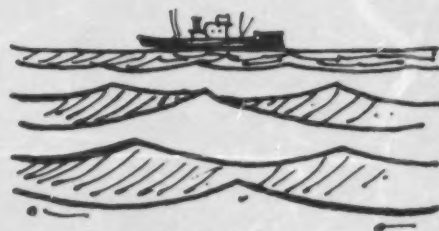
SUN



WOOD



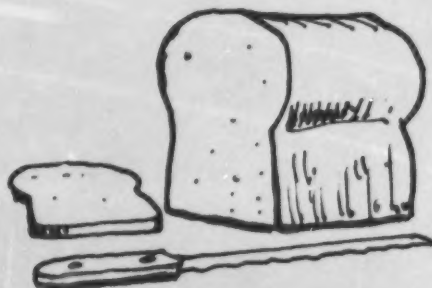
WIND



WAVES



URANIUM ORE

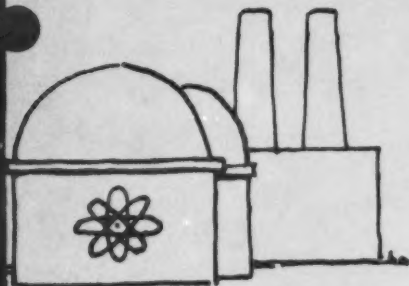


FOOD



WATER

ENERGY NAMETAG/ENERGY CHAIN ACTIVITY



NUCLEAR POWER



PLANTS



GEO THERMAL



GARBAGE



HYDROELECTRIC
POWER



EARTH



DINASAURS -
FOSSIL FUELS



ANIMAL + PHYSICAL
POWER

ENERGY SOURCE DEFINITIONS

The SUN is our main source of energy. All energy sources depend on the sun. It heats the earth, causes the weather and is needed for plant growth. It's our source of solar energy.

PLANTS are converters of sunlight to energy which can be eaten by animals and people. Trees are also plants that store sun energy.

The source of WIND power is the sun. Wind is energy that comes from air that's been heated by the sun. The warm air rises, keeps on the move and causes wind. Wind power can generate electricity, drive windmills, move sailboats, kites and hot air balloons.

WINDMILLS depend on the wind for their energy. Windmills harness the wind and can pump water, saw wood and generate electricity.

WOOD comes from trees and is stored sunlight energy. When we burn wood, we release heat energy.

WATER needs the sun. The sun causes water to evaporate, collect in clouds and then return to earth in the form of rain. Water power depends on the movement of water and comes in the form of waves, hydropower, tides and ocean currents.

WAVES are an energy source that comes from moving water that's been heated by the sun.

HYDROELECTRIC power is power that comes from flowing water. Huge dams are built on large rivers to harness this form of energy. It is an important source of electricity.

The EARTH produces its energy sources with the help of the sun. From inside the earth come a variety of energy sources.

GEOTHERMAL energy is natural steam heat energy that comes from inside the earth. It can be used to produce electricity and heat buildings.

URANIUM is mined and taken out of the earth and is used in nuclear power. It is heat energy that is released when the uranium atoms split up.

FOSSIL FUELS are energy sources that are taken from inside the earth and are made from a combination of decaying plants and animals, like dinosaurs, that are under pressure in the earth's crust and heated by the sun. It takes millions of years to produce these kinds of fuels.

OIL is a fossil fuel that's trapped in porous rock beneath the earth's surface. To capture it, we must drill thousands of feet beneath the earth. Many products can be made from oil such as plastic, fertilizer, nylon and medicine. Oil can also be used to heat our homes and buildings.

NATURAL GAS is a fossil fuel that's also trapped in layers of rock beneath the earth's surface. It must also be drilled for and sometimes such deep wells must be drilled that more energy is used to recover it than it can produce. It is the cleanest burning of the fossil fuels and is used for heating water and buildings, processing, cooking and drying.

COAL is another fossil fuel that must be mined. It is our most abundant fossil fuel and is used mainly to generate electricity. There are environmental problems such as water and air pollution that are created when coal is burned.

GASOLINE is made from oil which is pumped out of deep wells in the ground. It is used to power our cars, trucks, buses, etc.

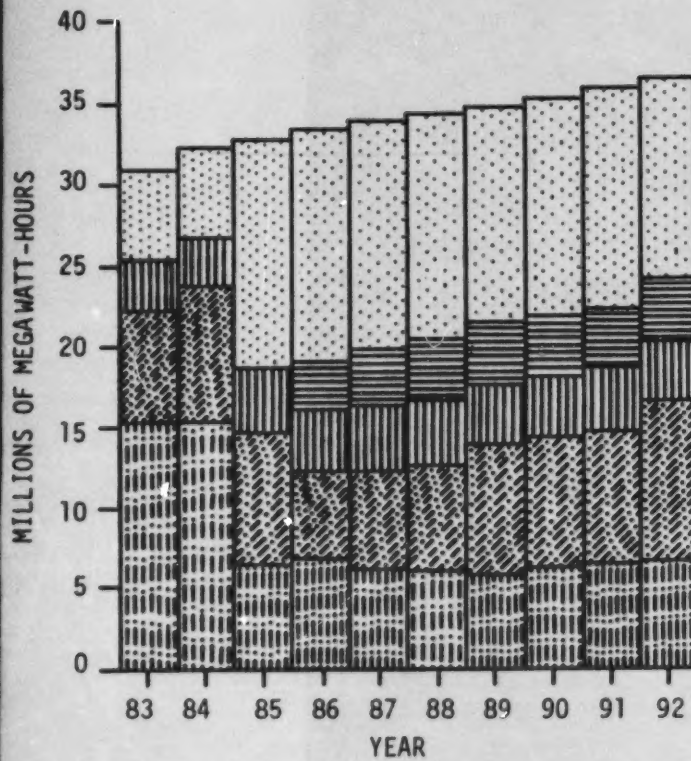
NUCLEAR POWER is an energy source that uses uranium. It gets its energy from the heat given off by splitting uranium atoms. It's mainly used for producing electricity, but there are still many problems to overcome before this energy source can be used extensively.

FOOD is an energy source for people and animals. Food energy depends on plants whether it's a loaf of bread, which comes from grain, or a hamburger, which comes from an animal that was raised on plants for feed.

ANIMAL AND PHYSICAL POWER are two of the oldest kinds of energy sources. In order for both animals and people to do work, they need food energy.

GARBAGE refers to all the waste products produced by man and animals. Trash and sewage or sludge can be used to generate electricity or can be converted to methanol to substitute for natural gas, to methane to increase our supply of natural gas or burned directly like wood.

ENERGY BY FUEL SOURCE



	PERCENT SHARE BY YEAR			
	83	85	88	91
PURCHASES	18	43	40	37
NUCLEAR	0	0	11	11
COAL	10	12	11	11
OIL	0	0	0	0
LA. GAS	23	25	20	23
TEXAS GAS	49	20	18	18

**SUPER EARTH
CAN RUN OUT OF OIL!**



Energy Crossword Puzzle
By Anita Gorden*

Background:

This puzzle was designed for high school students investigating energy. Terms used in the crossword puzzle are basic energy concepts, in order for this learning activity to be applicable to energy units in housing, clothing, foods, personal care, and family living.

Intended Use:

This puzzle can be used as a teaching aid, unit review, or as a self-instructional learning experience.

Objective:

To familiarize the student with key terms and facts related to energy.

Directions:

ACROSS:

2. A nuclear reaction involving the combination of smaller particles into larger ones with the release of energy.
5. A residue of coal used for fuel.
7. Our source of solar energy.
8. The quantity of heat required to raise the temperature of one pound of water one degree Fahrenheit.
10. Identifies natural or synthetic fabric.
11. Less than one percent of the atoms of this element will produce energy in a nuclear reactor.
13. Not any.
14. Basic building block of all matter.
15. A means of payment for your utility bill.
16. The outlay or expenditure for energy.

*This activity was written at a DOE-sponsored workshop directed by Ella Jedlicka at U.N.I., Cedar Falls, Iowa, June, 1978.

18. Official examination of building for heat usage.
20. This energy resource is formed from the fossils of ancient plants and animals.
22. The amount of force employed to move a quantity of electricity.
24. Radiant energy which an observer can see.
25. This type of bulb gives more light per watt of electricity than others.
28. The energy produced by splitting atoms in a nuclear reactor (2 words).
29. Insulation in the _____ can cut energy loss through the roof.
32. Designed to prevent heat loss (clue: _____ underwear).
37. A demand for repetition.
40. Series of events that recur regularly.
41. A large international petroleum company.
43. The external conditions and influences affecting your life and development.
44. Recent; fresh.
46. A unit that measures the rate at which energy is produced or used.
48. Perennial plants that are a source of a fuel.
50. American demand for this resource has doubled repeatedly every 10-18 years.
51. A substance used to produce heat energy.
52. After the expected time.
54. Emission and propagation of energy through space.
56. A material essential to every living thing.
57. Department of Energy.
59. A solid fuel, mostly carbon.
60. Making only one _____ or less to the grocery store each week saves energy.

62. Source of warmth and light.
64. An enclosed structure in which heat is produced.
67. _____ consumption is expected to triple in the next twenty years if it follows past trends.
69. Prudent; thrifty.
71. An electric current that reverses its direction at regularly recurring intervals.
72. The largest energy consumer in the world.
73. Extending for a considerable distance.

DOWN:

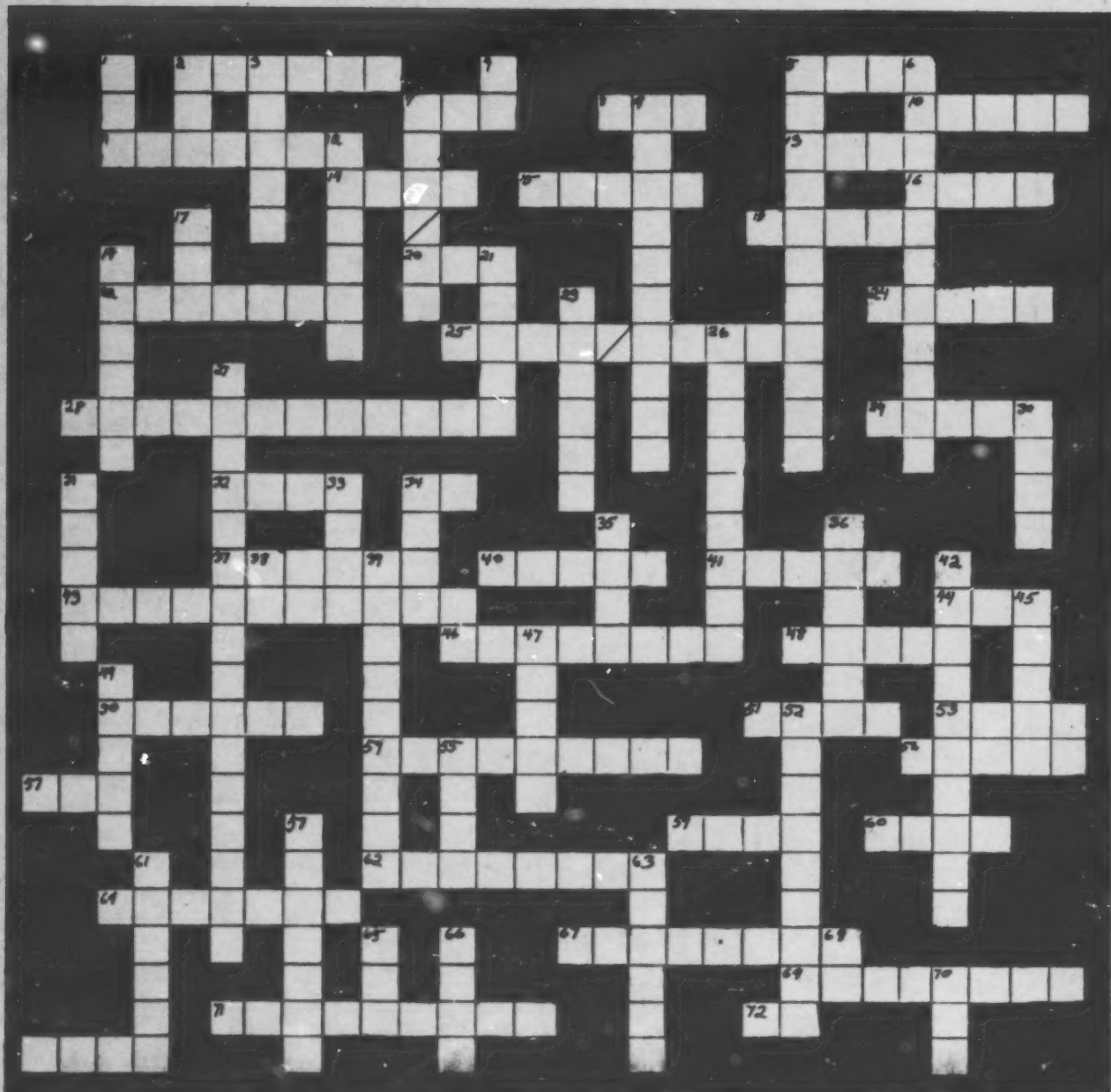
1. This puzzle contains words _____ should know concerning energy.
2. Federal Housing Administration.
3. One effective energy conservation measure for mobile homes is building an enclosure called a _____ to keep wind from sweeping under the floor.
(Hint: article of clothing for women)
4. When the television is _____ and no one is watching, energy is being wasted.
5. Your use of economic goods to supply your wants and needs.
6. This is a very convenient power supply.
7. There is no electrical (7 letters), so it's made to order when you need it.
9. A device for regulating room temperature.
12. Anything which is solid, liquid, or gas.
17. A liquid fuel formed from the fossils of animals and plants.
19. The measure of resistance to heat flow; used to rate insulation.
21. Radiation energy from the sun.
23. Coal, oil, and natural gas are examples of _____ fuels because they originate from geologic deposits of ancient plant and animal life.

26. An appliance is _____ if it has a high ratio of useful work performed in relation to the amount of energy it uses.
27. Reduces drafts by making sure that all doors and windows fit their frames snugly.
30. When washing clothes, use _____ water to conserve energy.
31. The time rate at which work is done.
33. A southfacing _____ receives maximum sun in the winter.
34. Hearty approval.
35. Circulate; move freely.
36. A generative force.
38. If present trends continue, will the American energy demand remain constant until the year 2000?
39. Natural gas, coal, oil, and wood are natural _____.
42. Substances that can slow down the flow of heat and sound in your home.
45. Energy that escapes as heat without doing any work.
47. Nearby (clue: your _____ extension office is a source of energy information
49. An instrument for measuring the amount of fuel used.
52. Heat, power, water, telephone.
55. One of nature's best insulators comes from birds.
58. Large group of people enjoying available energy.
61. Exchanging money for energy.
63. Able to do work.
65. Energy Efficiency Ratio.
66. Highest portion of the daily energy load.
70. The way to leave lights in an empty room.

Gorden Energy Puzzle Key

Y F U S I O N O C O K E
 O H K S U N B T U O L A B E L
 U R A N I U M T H N O N E
 R A T O M M O N E Y S C O S T
 O T T R / A R A U D I T
 R I T G A S M M R
 V O L T A G E E O F O P L I G H T
 A R F L U O R E S C E N T C
 L W A S T F I I
 N U C L E A R P O W E R S A F O A T T I C
 E A I T I N Y O
 P T H E R M A L L C L
 O H O M F I S D
 W E N C O R E C Y C L E E X X O N I
 E N V I R O N M E N T O N U N E W
 R S S K I L O W A T T T R E E S A
 M T O O C U S
 E N E R G Y U C F U E L L A T E
 T I R A D I A T I O N T W A T E R
 D O E P C O L I T
 R P S E W C O A L T R I P
 B I O S U N S H I N E I O
 F U R N A C E N T N
 Y G I E P E L E C T R I C
 I E E E R E C O N O M I C
 N A L T E R N A T E G U S F
 L O N G Y K Y F

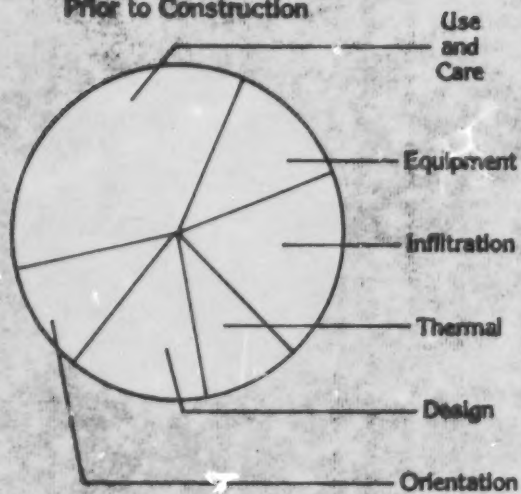
Words About Energy



Crossword Puzzle by Anita Gorden
West Liberty High School
West Liberty, Iowa

IMPACT OF USE AND CARE ON TOTAL HOME ENERGY CONSUMPTION

Average Home's Savings Potential
Prior to Construction



100% of Cost-Effective Savings Potential
Is In Proper Use and Care
for Most N.E.W. Homes



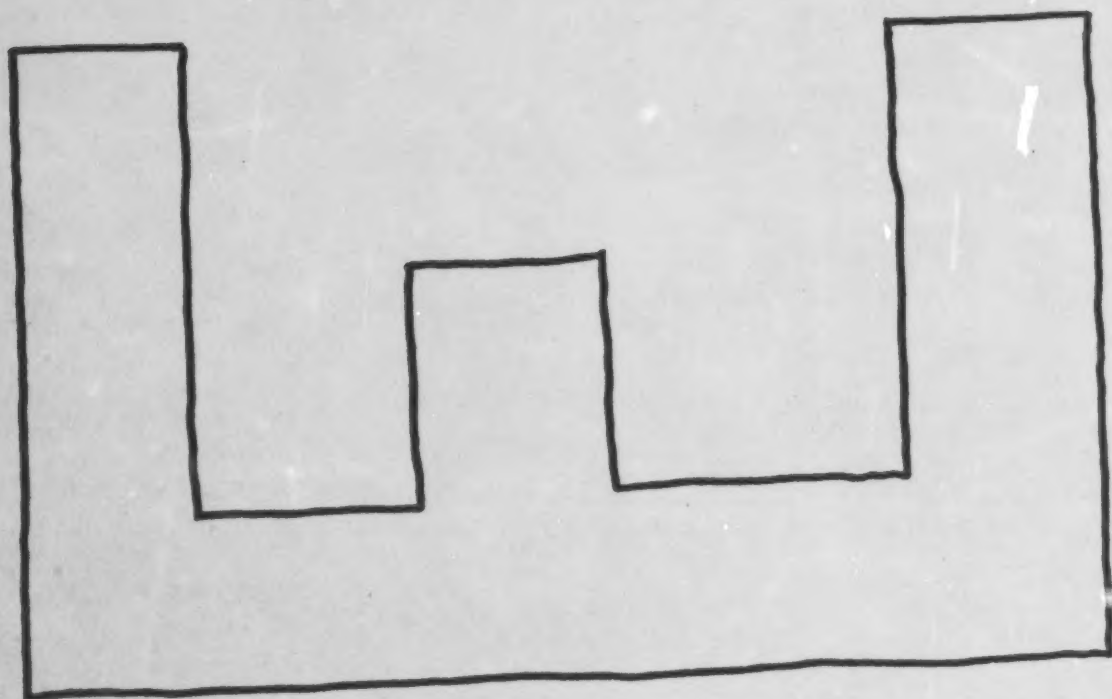
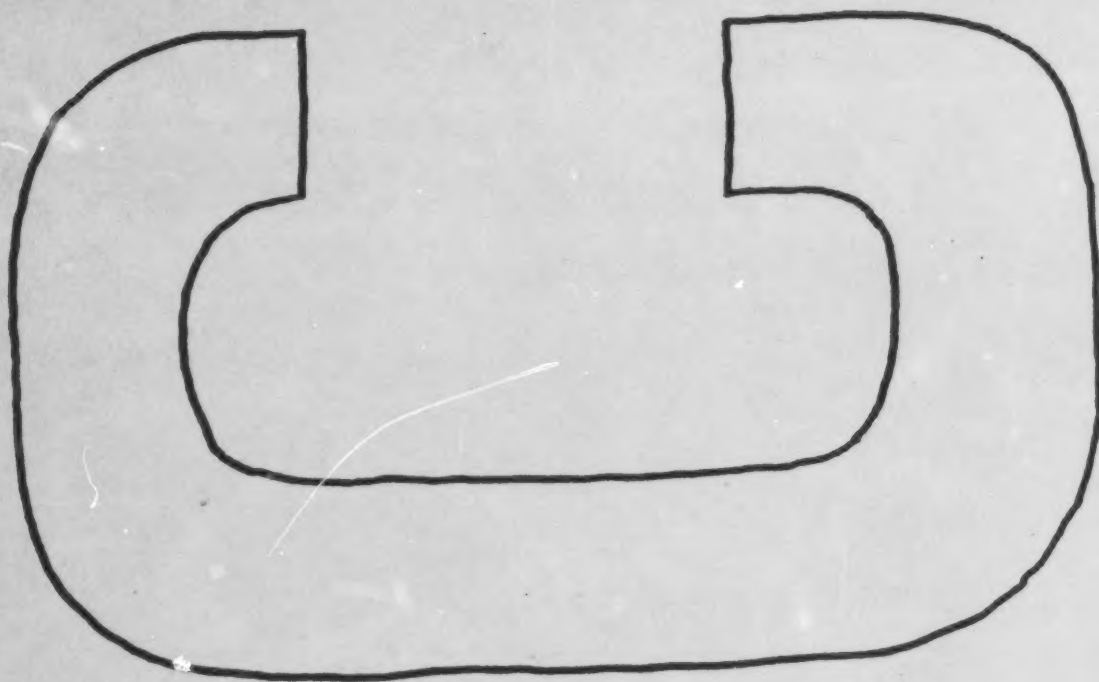
THE BAKER'S DOZEN

1. List all electrical devices in your house.
2. Total this list.
3. Check around the class to see who has the longest list. Read it aloud so others have a chance to add any appliances they may have forgotten.
4. Check the 13 electrical devices that are most important to you.
5. Draw a line through the four you can most easily do without.
6. Draw a circle around the four you could least easily do without.

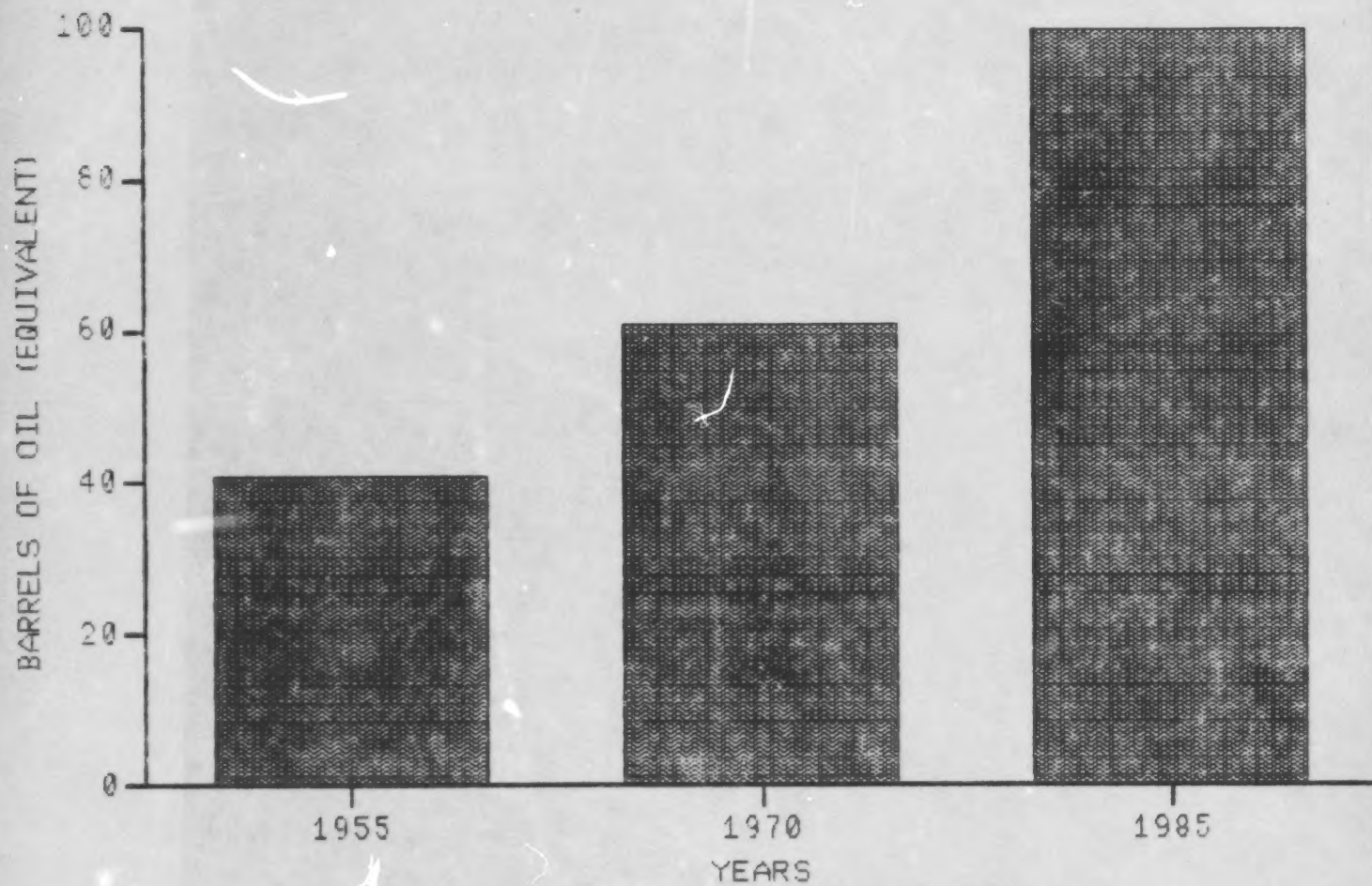
Limit yourself to a one or two paragraph answer for the following questions.

7. What causes black outs and brown outs?
8. Who actually controls a public power company?
9. What are the particular advantages of electricity?
10. What do you do to conserve electric power?
11. Generate a list of essential services which require electricity that you and your community are dependent upon.
12. Explain how power companies contribute to air and thermal pollution.
13. Describe how your favorite electrical device may be powered in the year 2010.

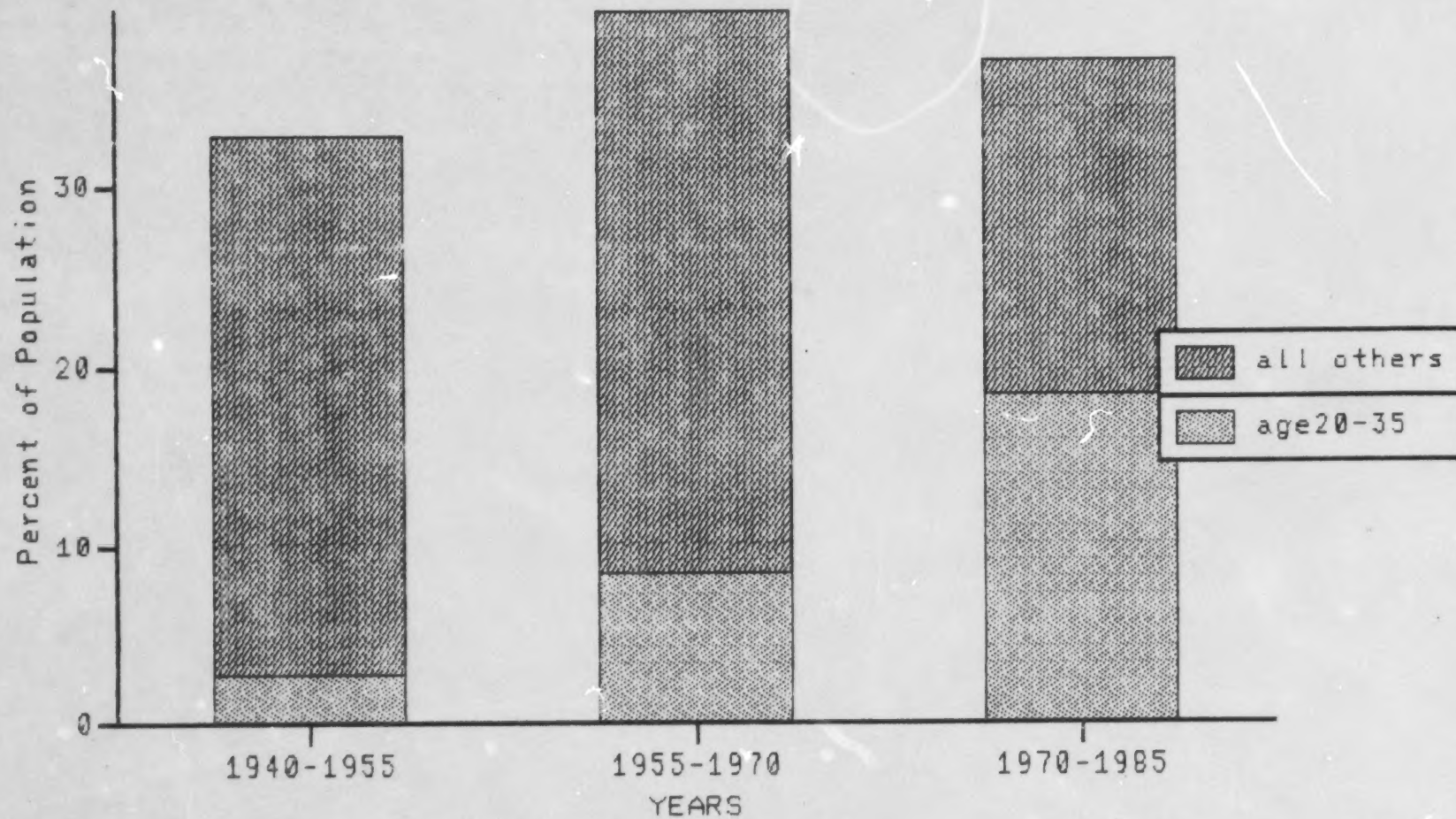
Student activity suggested by Paul D. Knapp, Linn-Mar High School, Marion, IA.

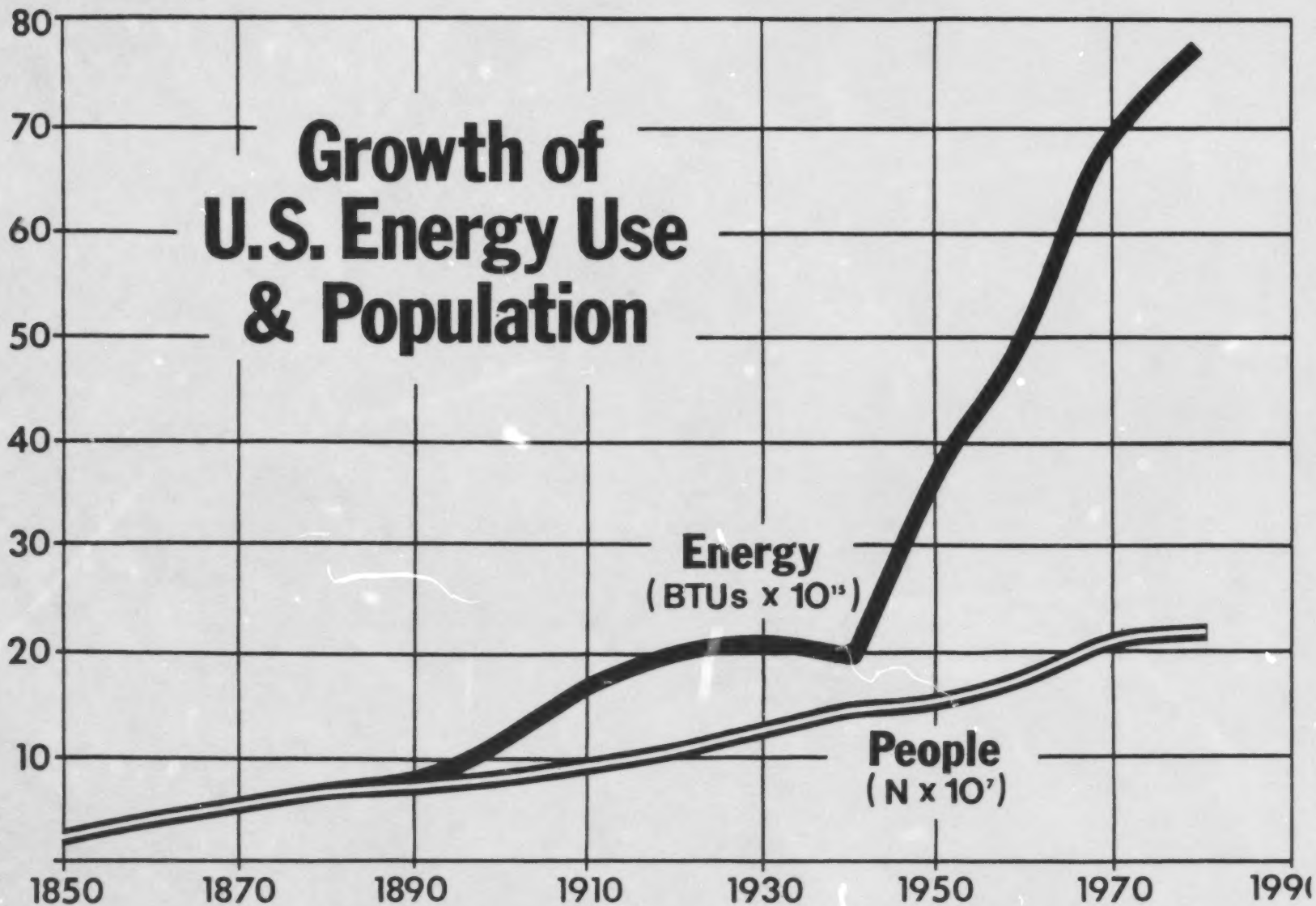


PER CAPITA USE OF ENERGY Barrels of Oil Equivalent



POPULATION GROWTH





U.S. Department of Commerce, Bureau of the Census, *Historical Statistics of the United States: Colonial Times to 1970*, Washington, DC, 1975.

CONSERVATION QUESTIONNAIRE

Directions: Read each statement below carefully and consider your conservation practices. Check the space which best describes your practices:

NO OPPORTUNITY to do it
NEVER do it, but have opportunity
SOMETIMES
OFTEN
ALWAYS

	No Opportunity	Never	Sometimes	Often	Always
1. When possible, I bicycle or walk instead of using the car.	—	—	—	—	—
2. I turn off the television, radio, or stereo when not in use.	—	—	—	—	—
3. I air-dry my hair instead of using an electric dryer.	—	—	—	—	—
4. I use recreational facilities close to home.	—	—	—	—	—
5. To keep warm in the winter, I wear several layers of clothing.	—	—	—	—	—
6. I select foods that require little or no cooking.	—	—	—	—	—
7. I shut drapes or shades in the winter to keep out the cold.	—	—	—	—	—
8. I plan with my family so we use the car less.	—	—	—	—	—
9. I turn down the furnace thermostat in the winter.	—	—	—	—	—
10. I turn the electric stove units off a few minutes before the cooking time is up.	—	—	—	—	—
11. I drive at a steady speed.	—	—	—	—	—
12. I select garment fiber content, such as cotton, wool or polyester according to temperature or weather.	—	—	—	—	—
13. I turn up the thermostat in the summer.	—	—	—	—	—
14. I choose leisure activities such as hiking, camping, horseback riding, and picnicing that do not require electricity or gas.	—	—	—	—	—
15. I dry clothes on lines, racks, or hangers instead of using the clothes dryer.	—	—	—	—	—
16. During the summer, I take advantage of breezes by opening windows and/or doors.	—	—	—	—	—

No
Opportunity Never Sometimes Often Always

17. I help with simple home repairs, such as applying caulking or weatherstripping, and repairing leaky faucets.	—	—	—	—	—
18. I use major appliances, such as the dishwasher, oven, and dryer at night or in the early morning to avoid heating up the house on hot days.	—	—	—	—	—
19. I step on the accelerator smoothly and slowly when driving.	—	—	—	—	—
20. I run water continuously when washing my hands or face, brushing my teeth, or shaving.	—	—	—	—	—
21. I turn out the lights when leaving a room.	—	—	—	—	—
22. When helping prepare meals I use one appliance, such as the oven or crockpot, instead of several.	—	—	—	—	—
23. I wash single items of clothing by hand instead of using the washing machine.	—	—	—	—	—
24. When cooking foods, I use a tight-fitting lid on the pan.	—	—	—	—	—
25. I use mass transportation when possible, such as the bus.	—	—	—	—	—
26. I shut drapes or shades to keep out the sun in summer.	—	—	—	—	—
27. When using the washing machine or clothes dryer, I wait until there is a full load of clothes.	—	—	—	—	—
28. I preheat the oven only when necessary.	—	—	—	—	—
29. When using the washing machine, I use cold water for washing and rinsing.	—	—	—	—	—
30. I turn off electric appliances such as dryers, curlers, and shavers, when not in use.	—	—	—	—	—

SCORING

On all items except item 20, if you marked an item "often," "always," or "no opportunity," count one point. If you marked any of the items "sometimes," or "never," do not count any points. If you marked item 20 "sometimes," "never," or "no opportunity," give your self one point. If you marked item 20 "often,"

or "always," do not give yourself any points. Total the number of points, and compare with the scale below.

- 30-28 Good job. Keep leading us; serve as own inspiration.
- 27-25 You are getting close. Keep up the good work. Take a look at what you are doing; start to make some changes.
- 20-17 You know you can do better. Why not begin to make the needed changes?
- 16-0 You have a way to go. You probably have a sneaky suspicion that you should have begun yesterday. Look around at others who are trying to conserve, and ask yourself how you can adapt conservation practices to your life.

FOLLOW-UP QUESTIONS

What does the word "conservation" mean to you? Give some examples of conservation practices you follow in your life.

What is the average conservation practice score of the class? Do you think your class is doing a good job in their conservation practices? Why or why not?

What conservation practices are you following?

What conservation practices do you need to improve?

What practices would be easiest to change?

Why?

What practices would be more difficult to change? Why? How can you begin? Once you begin, what incentives would you have to continue?

Source: Tips & Topics, Texas Tech. University



ENERGY ATTITUDE SURVEY

	<u>Yes</u>	<u>No</u>	<u>Don't Know</u>
1. Do you believe there is an energy shortage:	—	—	—
2. Do you believe you have been given a realistic picture of the energy situation facing the United States?	—	—	—
3. Do you believe most Americans are energy "wasters?"	—	—	—
4. Do you believe most American are energy conservers?"	—	—	—
5. Do you believe Americans are "spoiled," self-indulgent and reluctant to take responsibility for the future?	—	—	—
6. Do you believe it is the responsibility of every U.S. citizen to conserve energy voluntarily?	—	—	—
7. Do you believe Americans will conserve energy only when government controls are imposed?	—	—	—
8. Do you believe energy conservation always means doing without?	—	—	—
9. Would you be willing to reduce your standard of living to conserve energy?	—	—	—
10. Do you believe you as an individual can make an impact on energy consumption?	—	—	—
11. Would you conserve energy to save money?	—	—	—
12. Do you think the <u>money saved</u> is worth the inconvenience of conserving energy?	—	—	—
13. Do you think the <u>energy saved</u> is worth the inconvenience of conserving energy?	—	—	—
14. Do you feel technology will "bail us out" of the energy shortage?	—	—	—
15. Do you feel you have any input or participation in the energy usage decisions made by your family?	—	—	—
16. Are you going to <u>do</u> something to save energy?	—	—	—

HOW DO YOU FEEL ABOUT ENERGY?

	<u>Yes</u>	<u>No</u>	<u>Don't Know</u>
1. Do you believe we're running out of energy?	—	—	—
2. Do you believe people use more energy than they really need?	—	—	—
3. Do you believe people use energy wisely?	—	—	—
4. Do you believe it's the responsibility of every person to use energy wisely?	—	—	—
5. Do you believe we need laws in order to save energy?	—	—	—
6. Do you believe that things in your life will have to change if you save energy?	—	—	—
7. Do you understand what the energy problem is all about?	—	—	—
8. Do you believe energy needs to be saved?	—	—	—
9. Do you save energy?	—	—	—
10. Would you be willing to have energy?	—	—	—

HOW TO READ YOUR METER

The meter is a device which measures the amount of electricity used in a home. The meter records the measurement in kilowatthours (KWH).

Reading the meter is easy to do. Just remember these things:

1. Always read the dials from left to right.
2. If the hand on a dial is between two numbers, always record the lower number. When the hand is between 0 and 9, always read it as 9.
3. Be sure to make the reading at the same time each day.
4. Subtract the first day's reading from the second day's reading to find the KWHs used.

Now: Start with the dial on the left in Example A...its hand has passed 7 and is on its way to 8; so you read it as 7. Go to the second dial...the hand has passed 6 and is on its way to 7; so you read it as 6. On the third dial...the hand is not quite on 3; therefore, you read it as 2. On the fourth dial, the hand has not reached 2 and you read it as 1. On the fifth dial, the hand is between 4 and 5; so you read it as 4.

Write the figures just as you read them from dial to dial--from left to right. Your electric meter reading is 7-6-2-1-4.

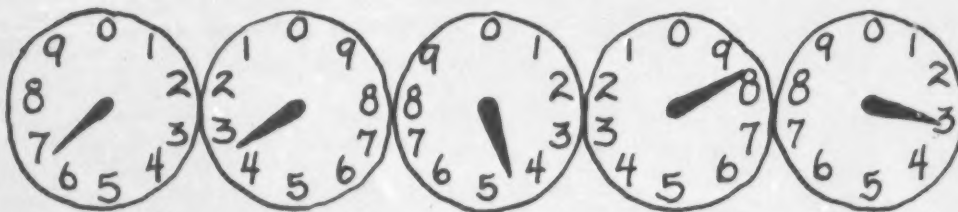
At a later date, say a month later, your meter dials may look like Example B.

This reading is 7-7-1-9-9.

How much electricity has been used? The difference between the meter readings - 76214 and 77199 - is the amount you have used. In this case it is 985 kilowatt-hours (KWH).

HOW MUCH ELECTRICITY HAS BEEN USED

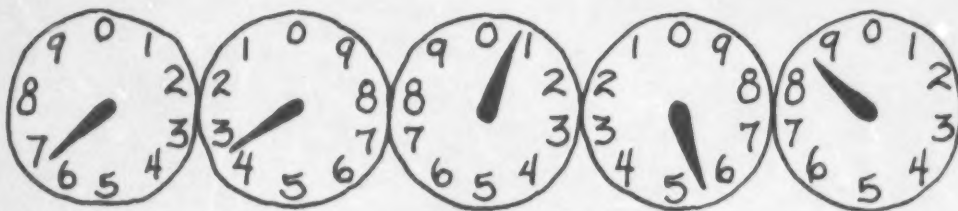
FIGURE THE KILOWATTS USED
BY SUBTRACTING METER READINGS 1 FROM METER READINGS 2



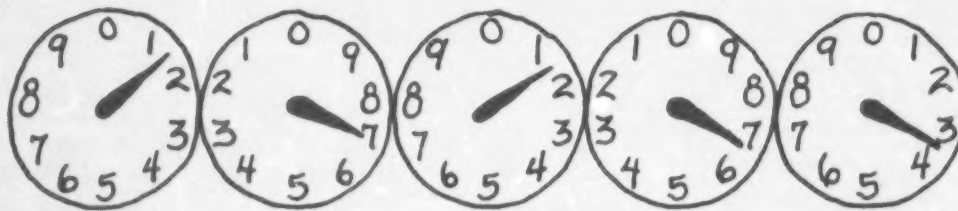
SET 1

READING 2

READING 1



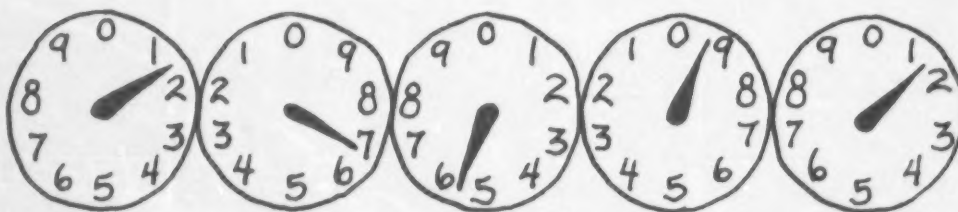
TOTAL KWH USED



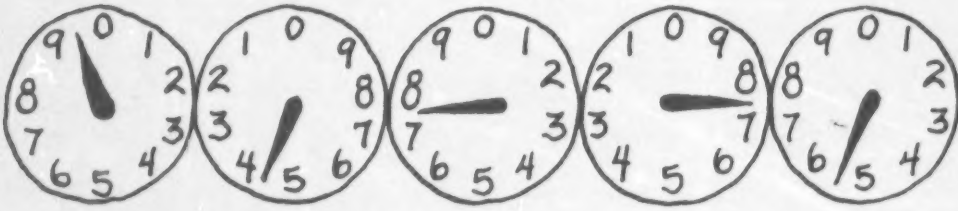
SET 2

READING 2

READING 1



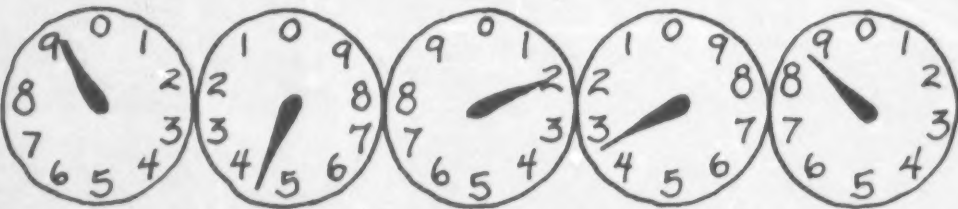
TOTAL KWH USED



SET 3

READING 2

READING 1



TOTAL KWH USED

KEY

HOW MUCH ELECTRICITY HAS BEEN USED

Set 1 63483
- 63058
425

Set 2 17163
- 16591
572

Set 3 94775
- 94238
537

READ YOUR METER - DAILY ACTIVITY

Locate your home's electric meter and record the readings on the dials or numbers the same way you did on the activity sheet used in class. Keep your readings for a week. Subtract each successive day's readings from the previous day to find the difference. That will be the number of KWH used that day. Be sure to take your reading at the same time every day. Ask your parents what appliances they used the day of each readings and how long they used each. Discuss with your parents what appliances may have made a higher/lower reading.

FIRST READING:

Time _____ Date _____

Appliances Used _____

Comments on temperature, special situations as visitors, etc.

Day 1

Reading 2 _____

-Reading 1 _____

Total KWH Used Day 1 _____

SECOND READING:

Time _____ Date _____

Appliances Used _____

Day 2

Reading 3 _____

-Reading 2 _____

Total KWH Used Day 2 _____

THIRD READING:

Time _____ Date _____

Appliances Used _____

Day 3

Reading 4 _____

-Reading 3 _____

Total KWH Used Day 3 _____

FOURTH READING:

Time _____ Date _____

Appliances Used _____

FIVE READING: _____

Time _____ Date _____

Appliances Used _____

SIX READING: _____

Time _____ Date _____

Appliances Used _____

SEVEN READING: _____

Time _____ Date _____

Appliances Used _____

EIGHT READING: _____

Time _____ Date _____

Appliances Used _____

Day 4

Reading 5 _____

-Reading 4 _____

Total KWH Used Day 4 _____

Day 5

Reading 6 _____

-Reading 5 _____

Total KWH Used Day 5 _____

Day 6

Reading 6 _____

-Reading 5 _____

Total KWH Used Day 6 _____

Day 7

Reading 7 _____

-Reading 6 _____

Total KWH Used Day 7 _____

Day 8

Reading 8 _____

-Reading 7 _____

Total KWH Used Day 8 _____

TOTAL AMOUNT OF ELECTRICITY USED FOR WEEK: _____

WHICH WAYS DID YOU USE THE MOST ELECTRICITY AND WHY? _____

WERE THERE ANY EXTREMES IN TEMPERATURE? DID ANY SPECIAL ACTIVITIES OCCUR
DURING THE WEEK? _____

INSTITUTE SOME ENERGY CONSERVATION MEASURES IN YOUR HOME AND DO ACTIVITY AGAIN.

READ YOUR METER WEEKLY ACTIVITY

Read your kilowatthour meter at home and record the reading.

A. _____

Read one week later and record the reading.

B. _____

Subtract A from B to determine KWH used during the 1st week of your experiment.

C. _____

During the 2nd week, encourage your family to conserve all the electricity possible. At the end of your 2nd week, again read the meter and record. At the same time as you did the week before.

D. _____

Subtract B from D to determine KWH used during the 2nd week of your experiment.

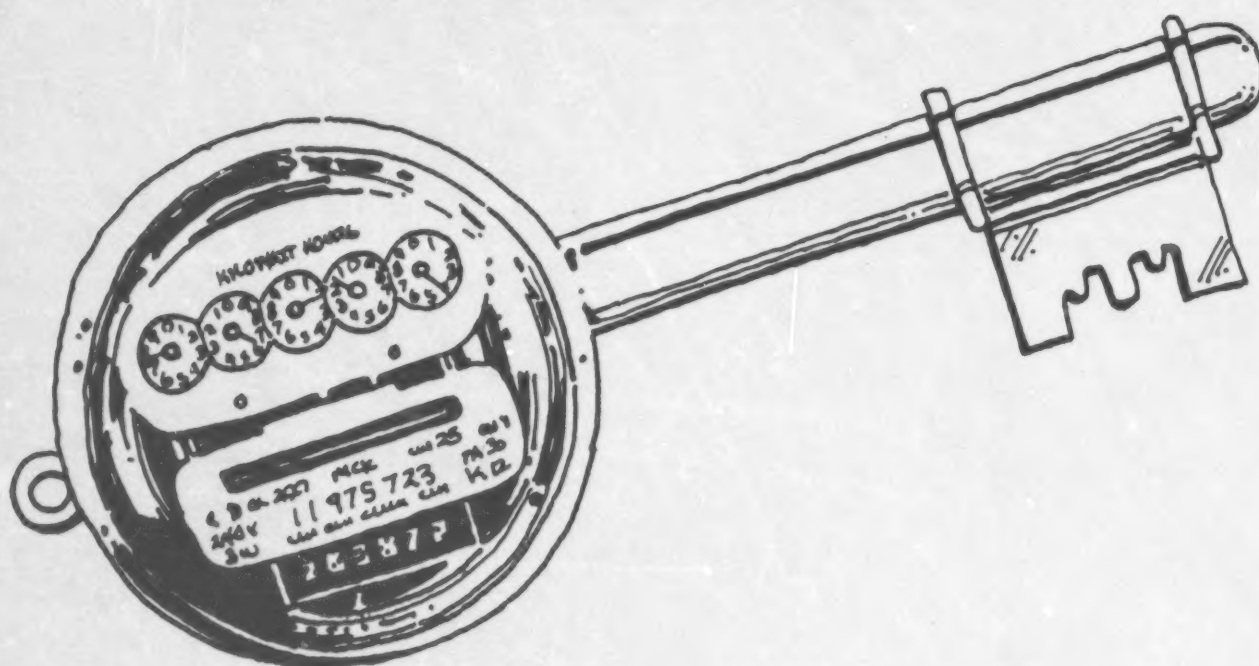
E. _____

Subtract C from E to determine how much electric energy your family saved over the previous week.

F. _____

1. Were you successful or did you use more electricity?
2. If you used more, can you explain why? Were there any extremes in temperature? Did any special activities occur such as visitors, etc.?
3. Why would someone with an electrically heated home have to consider the temperature during the two weeks?
4. List all the energy saving-steps your family took.

YOUR KEY TO ENERGY BUDGETING



HEAR ABOUT
ENERGY CONSERVATION

SEE
THE SAVINGS

DO SOMETHING
ABOUT ENERGY CONSERVATION

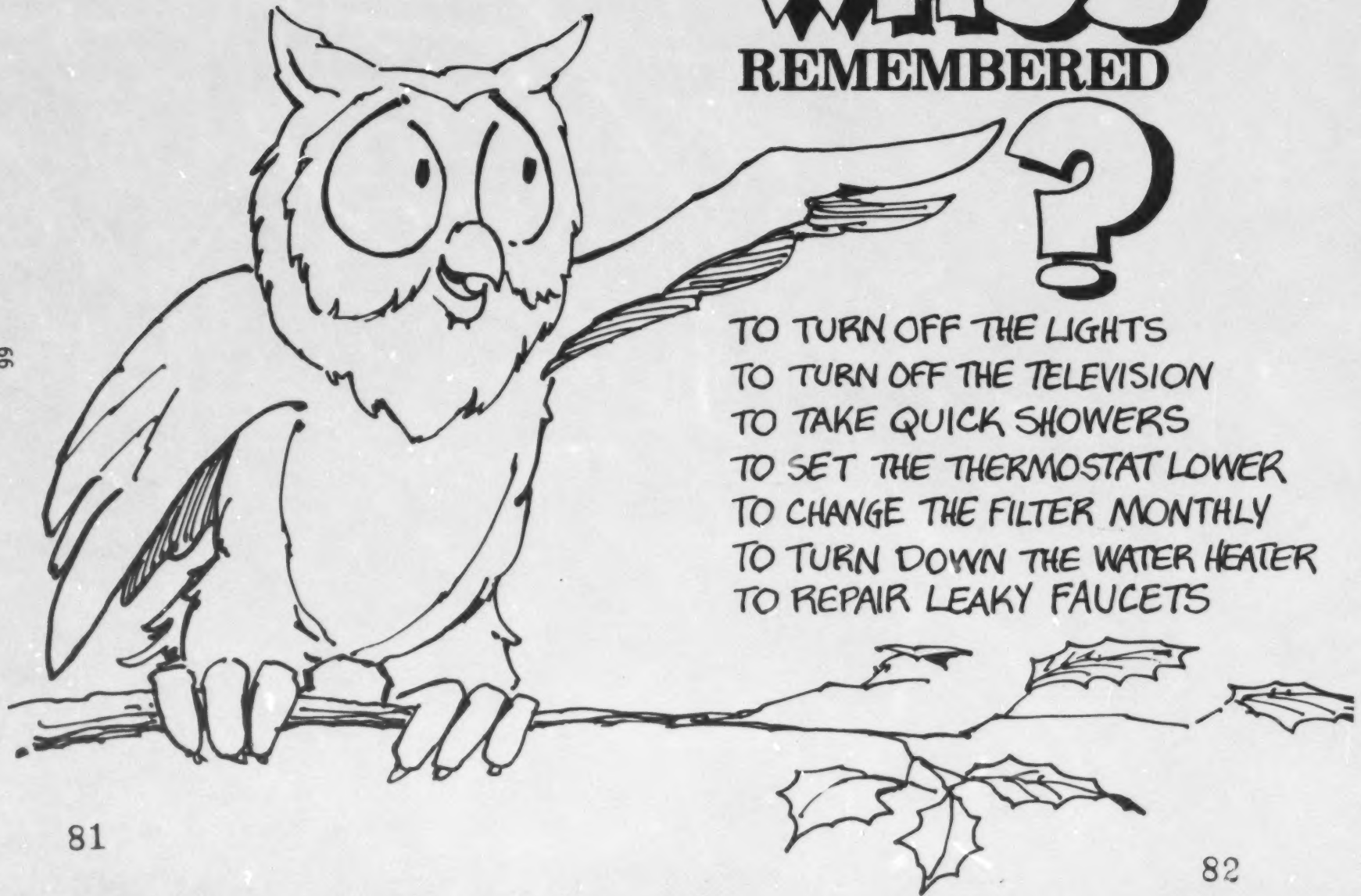


WHOO REMEMBERED



TO TURN OFF THE LIGHTS
TO TURN OFF THE TELEVISION
TO TAKE QUICK SHOWERS
TO SET THE THERMOSTAT LOWER
TO CHANGE THE FILTER MONTHLY
TO TURN DOWN THE WATER HEATER
TO REPAIR LEAKY FAUCETS

99

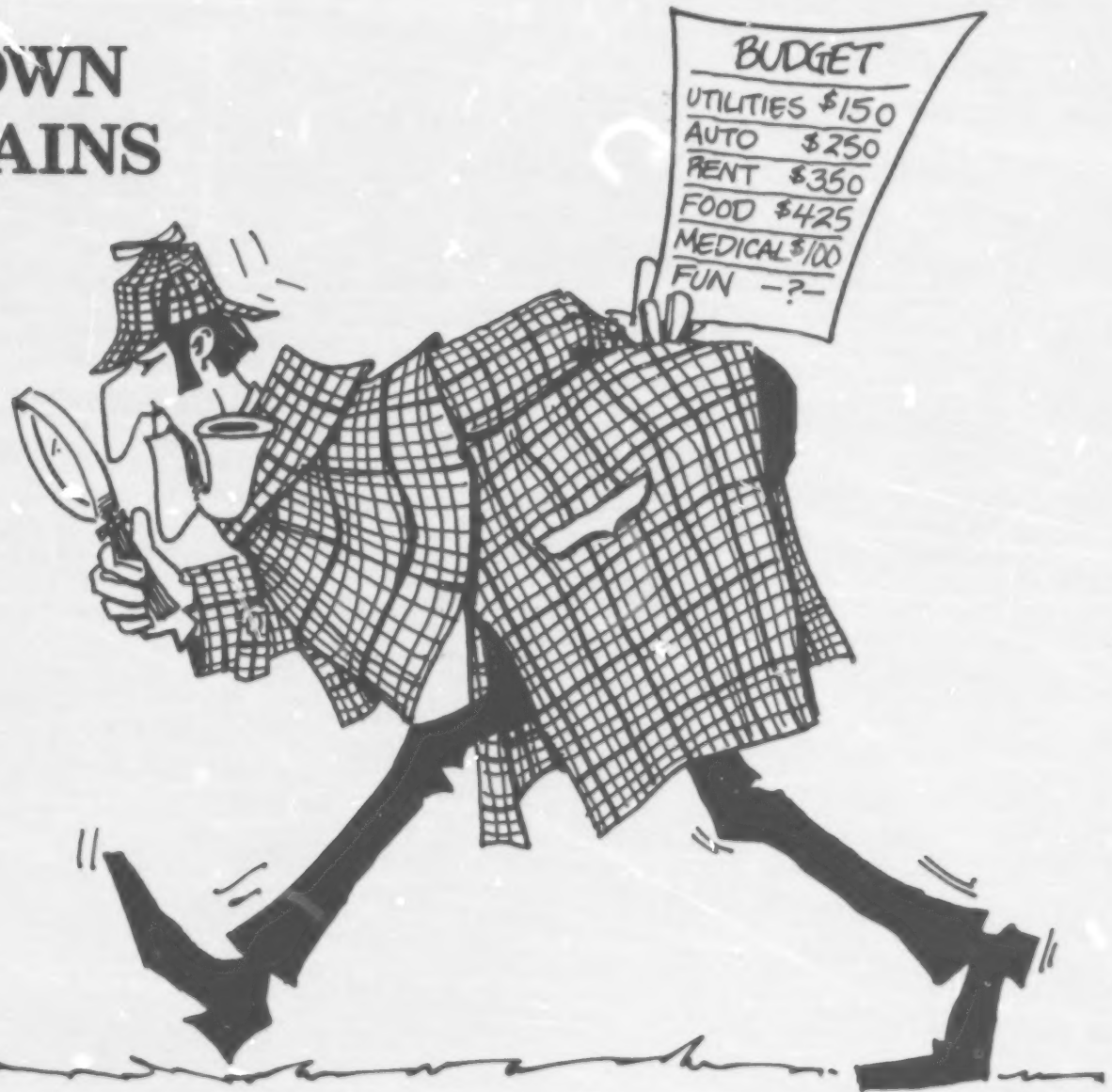


81

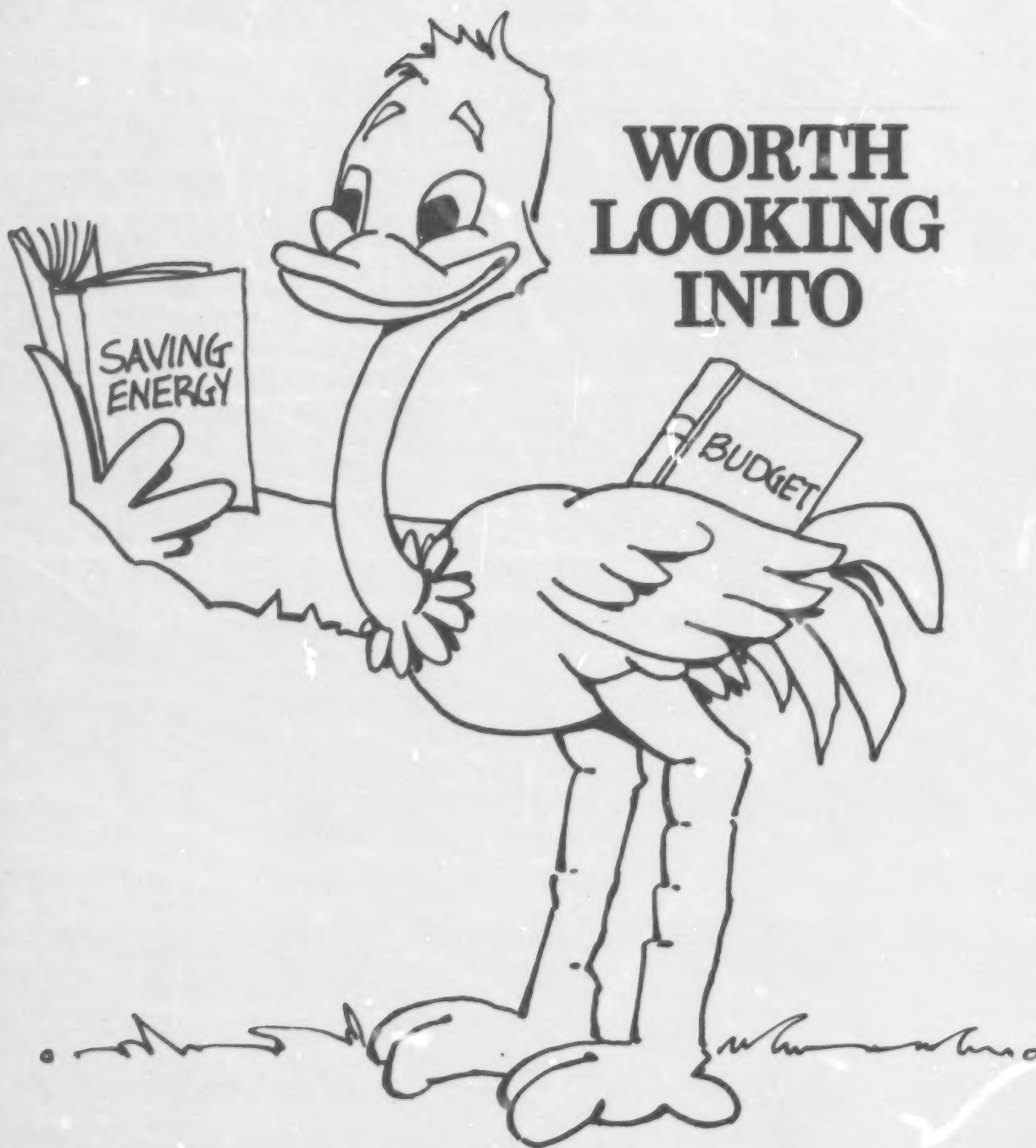
82

TRACK DOWN THE VILLAINS

LEAKY
FAUCETS
AIR LEAKS
LIGHTS ON
THERMOSTAT
SETTING
HOT WATER
NO INSULATION



WORTH LOOKING INTO



UNDERSTANDING THE ELECTRIC BILL

Buying electricity is similar to using a charge card for gasoline or clothing. When we receive the bill, it is hard to believe we owe that much.

John Doe felt the same way, so he called the utility company and told them he didn't understand how he could have used that much electricity. A representative from the company, Stephanie Brown visited Mr. Doe to explain the bill and check his home for areas that could be wasting energy.

First, Stephanie explained to Mr. Doe that he is billed for the electricity used during a certain period of time, called the Billing Period (See SAMPLE BILL). She explained that the billing periods may vary from 25 to 35 days. She further explained that the bill could vary due to extremes in hot or cold weather, five weekend months, changes in normal living conditions, and how appliances and equipment in the home are used. She gave him an information sheet to further explain. (See Common Causes of Bill Variation sheet).

The dates of the billing period are found in the second and third columns, METER READING DATES. The present meter reading date was on December 2 and the previous meter reading date was on November 4. The number of days, 29, is indicated on the bill.

The present and previous meter readings are shown in the third column, METER READINGS. The present reading is 61278 and the previous reading was 59124. The readings are given in kilowatthours (KWH), which is the amount of energy equal to 1000 watts of electricity for one hour.

To find out how many kwh of electricity are used during a billing period, the following formula is used:

KWH reading at the END of the billing period	61278
-KWH reading at the BEGINNING of the billing period	-59124
	2154

Stephaine showed Mr. Doe that this amount is listed in the fourth column of the bill, UNITS USED.

Mr. Doe then asked Stephanie to explain what is paid for in the bill and how the bill is figured. She explained that the amount on the first line of the AMOUNT column is for the electric service provided. To provide service to the customer, certain expenses are incurred. These expenses include construction costs, maintenance, taxes, operations, salaries, interest on loans, and fuel.

Construction costs include building new power plants and generating facilities, as well as additional electric lines and equipment in existing facilities. Maintenance costs cover keeping equipment in good working condition so that reliable service can be provided. Operation expenses include money spent in normal everyday workings of offices, plants, vehicles, and all other items used to keep electricity going. Also, taxes are paid, just like everyone else pays taxes, in order to help communities grow.

Fuel is the largest expense. To generate electricity, natural gas, coal, and oil are burned. At some utilities, uranium is used in a nuclear plant. Fuel costs are greatly increasing. The price of these fuels changes almost daily, and a utility company shops around to find the best price. Some utilities show the fuel adjustment rate on the bill as shown on this bill. The total cost of fuel is part of the amount on the first line of the AMOUNT column. The total KWH cost varies from billing period to billing period because the fuel adjustment changes slightly.

Next, Stephanie explained how the rates are figured. (See Sample Residential Rate and how Mr. Doe's Bill Is Figured). The rates vary from company to company. Rates change whenever new rates are granted by the state government. Stephanie informed Mr. Doe that the average cost this billing period was 7.1¢ per KWH. She gave him the current rate schedule and an example of how his bill is figured. The first 30 KWH or less used per month is \$7.50. Any additional KWH used cost 5.6¢ if used in May-October and 4.41¢/KWH, if used in November-April. The fuel adjustment cost is then figured and added to the amount on the first line. Mr. Doe also had a security light, which he had requested to be installed by the utility company. This costs an additional amount and is shown on the second line of the AMOUNT column. Not every customer has or wants a security light.

Also, the average daily cost is included on the bill strictly for the customer's convenience. The PROMPT PAYMENT DATE at the bottom of the bill indicates that the bill should be paid by that date.

Mr. Doe asked why his neighbor's bill was estimated. Stephanie explained that sometimes the meter reader is unable to get close enough to read the meter. If this happens, a card is sent to the customer to notify him that the reading is estimated.

Stephanie then performed an audit on Mr. Doe's house and discovered some areas where his home was wasting energy. She gave him an audit report on how he could cut down his energy use. After talking with Stephanie, he decided to try to reduce his energy use and lower his bill by being more energy conscious in using household appliances and making his house more energy efficient.

COMMON CAUSES OF BILL VARIATIONS

Residential electric bills will vary due to one or a combination of several causes. Following is an analysis of some more common reasons for bill variations:

- * Extremes of hot and cold weather including humidity and wind
- * Five weekend months
- * Long billing periods
- * Difference in fuel charge
- * Seasonal rates - (May-October-November-April)

CHANGES IN NORMAL LIVING CONDITIONS

- * Size of family
- * Average age of family
- * Visiting relatives/ additional washing
- * Repairs - power tools
- * Roomers
- * Sickness
- * Special diets
- * Changes in living habits
- * Guests and entertainment
- * Vacations

APPLIANCES

- * New appliances installed
- * Open fireplace damper
- * Excessive use of hot water
- * Additional use of older appliances
- * Leaking hot water faucets
- * Exposed hot water pipes
- * Larger refrigerator
- * Exposed hot water pipes
- * Defective appliances
- * Lack of maintenance
- clogged air filters
- frost in refrigerator
- * Inefficient use
- * Excessive cooling or heating
- oven for house heating
- thermostat control setting
- continuous use of fan on A/C unit
- * Portable electric heaters

MOVING TO DIFFERENT HOME OR APARTMENT

- * Larger than former home
- * Larger air conditioner
- * More leakage of air through windows
- * Larger electric heating
- * Ceilings not adequately insulated
- * Water heater farther from kitchen
- * Walls not adequately insulated
- * More appliances
- * More windows or glass

SAMPLE RESIDENTIAL RATE

A. Monthly Rate

	Billing Months of	
	May-October	November-April
First 30 KWH or Less Used Per Month	\$ 7.50	\$ 7.50
Additional KWH Used Per Month	5.60¢/KWH	4.41¢/KWH
Minimum Monthly Charge	\$ 7.50	

B. Fuel Adjustment

The cost of the fuel that it takes to generate the electricity you use. The fuel adjustment varies each month, depending upon the price the utility must pay for the fuel. The company makes no profit on this portion.

HOW MR. DOE'S BILL IS FIGURED

2154 KWH used

Step 1. First 30 KWH or Less Used Per Month \$ 7.50

Step 2. Additional KWH Used @ 4.41¢ KWH

2124	
x.0441¢	
2124	
8496	
8496	
93.6684	93.67

Step 3. Fuel Adjustment

2154	
x.02425	
52.24	52.25

Step 4. Security Light 78 KWH @ 4.41¢

x.0441
6.70

Step 5. Fuel Adjustment on Security Light 6.70

78	+1.89 Fuel	
x.02425	8.59	8.59
1.89		\$161.99 TOTAL

SAMPLE BILL



PLEASE KEEP THIS PORTION FOR YOUR RECORDS

GULF STATES UTILITIES COMPANY
P. O. Box 3007 Beaumont, TX 77704

IF YOU HAVE QUESTIONS
ABOUT YOUR BILL, PLEASE

CALL 504-387-0054

BILLING DESCRIPTION	METER READING DATES		METER READINGS		UNITS USED	LOAD READING	METER MULTI- PLIER	AMOUNT
	PRESENT	PREVIOUS	PRESENT	PREVIOUS				
Electric	05/11	04/13	41025	39786	1239			78.32
Gas	05/11	04/13	7315	7284	31			17.98
Your current billing period is for 28 days **Your average daily cost was \$3.44** Amount includes: Electric fuel adjustment at \$.01664 per unit Add'l cost of gas purchased at \$.42996 per unit To aid the aged, add \$1 to payment (tax deductible)								
DATE DOES NOT APPLY TO ANY AMOUNT ALREADY PAST DUE								
ACCOUNT NUMBER	Customer John W.				PAST DUE DATE	AMOUNT DUE AFTER PAST DUE DATE	AMOUNT DUE WHEN RENDERED	
12717-66308								
RATE CLASSIFICATION	3045 Anystreet				06/08/83	100.27	96.30	
Residential								

GSU423-00-83

PROBLEMS
UNDERSTANDING THE ELECTRIC BILL

I. Circle or underline the correct answer.

1. What is the average length of a billing period?
 - a. 10-15 days
 - b. 25-35 days
 - c. 40-50 days
2. How many KWH of electricity did Mr. Doe use?
 - a. 78
 - b. 59124
 - c. 2154
3. What is the length of the billing period?
 - a. 35
 - b. 25
 - c. 29
4. The total amount due is
 - a. \$143.76
 - b. \$161.99
 - c. \$ 6.53
5. The prompt payment date indicates
 - a. the date the bill is mailed
 - b. the date the meter is read
 - c. the date by which the bill must be paid
6. The electric bill you pay covers expenses necessary to provide service to your home: They include:
 - a. Maintenance costs
 - b. Construction costs
 - c. Fuel costs
 - d. None of these
 - e. All of these

KEY
UNDERSTANDING THE ELECTRIC BILL

1. b
 2. c
 3. c
 4. 161.99
 5. c
 6. ●
-

THIRD PARTY NOTIFICATION

Sometimes a utility must disconnect a customer's service for reasons such as past-due bills. When a customer's service is going to be disconnected a notice is sent to that customer in advance.

"Third Party Notification" can help in this situation. GSU will notify a third party, designated by the customer, by sending a duplicate "Disconnect Notice" to the third party. This party assumes no obligation to pay the past-due bill. However, that party can remind the customer about the pending disconnection.

This program is especially aimed at helping customers who are elderly, ill or disabled, or who have language or reading problems. It is also helpful for persons who live alone or who are gone from home for extended periods of time.

ENERGY ANALYSIS PROGRAM

GSU wants customers to use energy wisely. The company has offered a Home Energy Analysis Program since August, 1978. The purpose of the program is to help the homeowner realize where energy consumption can be reduced. An Energy Auditor inspects the customer's home. The auditor then reports to the customer how the home can be retrofitted (made energy efficient). GSU also offers a New Home Inspection Program, which provides guidelines for building energy-efficient construction features into a new home. In addition to helping the homeowner to obtain as low an operating cost as possible, GSU is able to reduce its requirements for new and costly generating facilities. In 1979, 1071 new homes had been built under the program and 5404 existing homes had been inspected. Out of the 5000 built between 1940 and 1975, only 618 passed as energy efficient.

SPECIAL ASSISTANCE PROGRAMS

Most utilities have trained personnel who work directly with customers involved in economic crises--perhaps a death or serious illness in the family or the late arrival of a public assistance payment. These contact persons work out payment agreements, taking into account when the customers receive their assistance payments. Also, they can refer customers to community agencies that might have funds available for utility bills. Additional information on groups that can help with food, clothing and other support is also available.

EQUAL PAYMENT PLAN

To even out the energy "highs and lows" in customers' budgets, some utilities offer a free service such as Gulf States' Equal Payment Plan.

Anyone who has been a GSU residential customer for a year and who has a good credit rating is eligible for this program.

GSU takes a customer's past year's utility bills and estimates an average monthly cost for the next twelve months. Paying this average cost allows customers to work energy payments into their family budgets.

At the end of the year, if the amount due for energy used is different from what was actually paid, that difference is figured into the Equal Payment amount for the next year.

The Equal Payment Plan won't change the amount of energy a customer uses, but it will make things easier when the customer figures a monthly budget.

APPLIANCE LABELING

Facts You Should Know About Appliance Labeling

When you shop for a major appliance, look for the new yellow and black EnergyGuide labels that will help you save money.

An EnergyGuide label shows the yearly energy cost of operating an appliance and allows you to compare it to the energy cost of competing brands and models of a similar size with similar features. When considered along with the purchase price, you'll be able to determine which appliance is less expensive to own and operate over the long run.

Appliances Covered

EnergyGuide labels are required on the following major appliances manufactured on or after May 19, 1980:

- Furnaces
- Refrigerators and refrigerator freezers
- Freezers
- Water heaters
- Clothes washers
- Dishwashers
- Room air conditioners

Central air conditioners and heat pumps will be labeled at a later date.

EnergyGuide labels will not be used for kitchen ranges or ovens, microwave ovens, television sets, clothes dryers, humidifiers and dehumidifiers, or home heating equipment other than furnaces. These appliances have less difference in operating costs between brands and models.

Labels also will not be required on small appliances, such as toasters, blenders, and coffee makers, because they require relatively little energy to operate.

The seven types of major appliances that are being labeled account for 73 percent of all energy consumed in American homes.

Federal Law

Appliance labeling was mandated by Congress as part of the Energy Conservation Policy Conservation Act of 1975. The U.S. Department of Energy and The Federal Trade Commission jointly manage its implementation.

Energy-Efficient Appliances

You may find that energy-saving appliances cost slightly more to buy because intermittent ignition devices, better motors and compressors, more or better insulation, or other special features make manufacturing somewhat more expensive. Over the lifetime of an appliance, however, the lower operating cost of many energy-efficient products more than offsets the higher purchase price and helps to pay back the initial expenditure.

To shop for the best buy on major appliances, you need to become familiar with three types of EnergyGuide labels: Energy Cost, Energy Efficiency Rating, and Generic.

Energy Cost Labels

Energy cost labels are used on refrigerators and refrigerator-freezers, freezers, water heaters, dishwashers, and clothes washers.

The large number in the center of the label is the estimated annual cost of the energy required to operate the appliance, based on a national average electricity rate of 4.97 cents per kilowatthour. The bar beneath it shows the range of operating costs of competing brands and models of similar size and features. Therefore, you will quickly be able to see how the model you are considering compares to others.

At the bottom of the label is a chart that allows you to determine more precisely what your cost to operate that appliance will be, based on your local utility rate.

Energy cost labels for dishwashers and clothes washers also include a chart that indicates the cost of running the appliance with either a gas water heater or an electric water heater. Your salesperson or utility company representative can tell you the energy rate for your area, or sometimes that information is included in your utility bill.

Energy Efficiency Rating Labels

Climate control appliances, such as room air conditioners, are labeled with an Energy Efficiency Rating (EER) or a Seasonal Energy Efficiency Rating (SEER). The rating is printed in large numbers in the center of the label. A higher number indicates a more efficient appliance.

There also is a range--printed just below the energy efficiency rating--for competing room air conditioners of the same cooling capacity so that you can make shopping comparisons easily. In addition to the energy efficiency rating, the label provides a cost/use chart so that you can calculate the energy cost of the appliance based on local electricity rate and expected hours of use.

Generic Labels

The generic label required on all furnaces contains general information on how to conserve energy in the home. It also directs you to an energy fact sheet developed by the manufacturer, which your dealer or heating system contractor will have for each product. The fact sheet contains information on system components and overall efficiency of different combinations, and gives energy costs of the system for various geographic locations and utility rates. Similar generic labels will be required for central air conditioning systems as soon as standards are final.

Use Appliances Wisely

In addition to buying the most energy-efficient appliances suited to your particular needs, you can save even more money and natural resources by the careful use of those appliances in your home. Consider combining loads in dishwashers and clothes washers, using low temperature settings where possible, avoiding unnecessary opening of refrigerator doors and other simple energy conservation methods. If we could cut residential energy use by only 20 percent, the reduction would amount to more than half a billion barrels of oil per year or about one-sixth of our nation's oil imports.

Refrigerator-Freezer
Capacity: 23 Cubic Feet

(Name of Corporation)
Model(s) AH503, AH504, AH507
Type of Defrost: Full Automatic

ENERGYGUIDE

Estimates on the scale are based
on a national average electric
rate of 4.97¢ per kilowatt hour.

Only models with 22.5 to 24.4
cubic feet are compared
in the scale.

Model with
lowest
energy cost
\$68

\$91

Model with
highest
energy cost
\$132

THIS ▼ MODEL ▼

Estimated yearly energy cost

Your cost will vary depending on your local energy rate and how
you use the product. This energy cost is based on U.S. Government standard tests.

How much will this model cost you to run yearly?

		Yearly cost
		Estimated yearly \$ cost shown below
Cost per kilowatt hour	2¢	\$36
	4¢	\$73
	6¢	\$109
	8¢	\$146
	10¢	\$182
	12¢	\$218

Ask your salesperson or local utility for the energy rate (cost per kilo-
watt hour) in your area.

Important Removal of this label before consumer purchase is a violation of
federal law (42 U.S.C. 6302)

(Part No. 371026)

Room Air Conditioner
Capacity: 8,000 BTU/hr

(Name of Corporation)
Model(s) SA 714, SA 718

ENERGYGUIDE

Models with the most efficient
energy rating number use less
energy and cost less to operate.

Models with 7800 to
8299 BTU's cool
about the same space.

↓
7.3

Least efficient
model
3.4

Most efficient
model
8.5

THIS MODEL ↓

Energy Efficiency Rating (EER)

This energy rating is based on U.S. Government standard tests.

How much will this model cost you to run yearly?

Yearly hours of use		250	750	1000	2000	3000
		Estimated yearly \$ cost shown below				
Cost per kilowatt hour	2¢	\$6	\$17	\$22	\$44	\$66
	4¢	\$11	\$33	\$44	\$88	\$132
	6¢	\$17	\$50	\$66	\$132	\$198
	8¢	\$22	\$66	\$88	\$176	\$264
	10¢	\$28	\$83	\$110	\$220	\$330
	12¢	\$33	\$99	\$132	\$264	\$396

Ask your salesperson or local utility for the energy rate (cost per kilowatt hour) in your area. Your cost will vary depending on your local energy rate and how you use the product.

Important Removal of this label before consumer purchase is a violation of federal law (42 U.S.C. 6302)

GPO 863 39 1

(Part No. 20648)

Dishwasher
Capacity: Standard

(Name of Corporation)
Model(s) CD1814, CL1950

ENERGYGUIDE

Estimates on the scale are based on a national average electric rate of 4.97 ¢ per kilowatt hour and a natural gas rate of 36.7 ¢ per therm

Only standard size dishwashers are used in the scale



Electric Water Heater

Gas Water Heater

Model with lowest energy cost \$62

\$89

Model with highest energy cost \$92

THIS MODEL



Model with lowest energy cost \$26

\$38

Model with highest energy cost \$40

THIS MODEL



Estimated yearly energy cost

Estimated yearly energy cost

Your cost will vary depending on your local energy rate and how you use the product. This energy cost is based on U.S. Government standard tests.

How much will this model cost you to run yearly?

with an electric water heater

with a gas water heater

Loads of dishes per week	2	4	5	8	12
Estimated yearly \$ cost shown below					
Cost per kilowatt hour	2¢	\$9	\$17	\$26	\$35 \$52
	4¢	\$17	\$34	\$52	\$69 \$103
	6¢	\$26	\$52	\$78	\$104 \$156
	8¢	\$34	\$69	\$104	\$138 \$207
	10¢	\$43	\$87	\$130	\$173 \$260
	12¢	\$52	\$104	\$156	\$208 \$312

Loads of dishes per week	2	4	6	8	12
Estimated yearly \$ cost shown below					
Cost per therm	10¢	\$5	\$10	\$15	\$19 \$29
	20¢	\$7	\$13	\$20	\$26 \$39
(100 cubic feet)	30¢	\$8	\$17	\$25	\$33 \$50
	40¢	\$10	\$20	\$30	\$40 \$60
	50¢	\$12	\$24	\$35	\$47 \$71
	60¢	\$13	\$27	\$41	\$54 \$81

Ask your salesperson or local utility for the energy rate (cost per kilowatt hour or therm) in your area, and for estimated costs if you have a propane or oil water heater.

Important Removal of this label before consumer purchase is a violation of federal law (42 U.S.C. 6302)

Part No. (73906)

USING ENERGYGUIDE LABELS FOR COMPARISON SHOPPING

If you have to choose between two appliances with the same features, capacities, and price, but with different annual energy costs, then obviously you are better off buying the one with the lower annual energy cost (the more energy-efficient model). In this case, you can simply look at the big number on each label, see which is lower, and take that model with you.

However, the purchase price of the energy-efficient model may be higher than the price of the standard model. (This is because extra insulation and more efficient motors often cost more.) But think again: the lower energy cost of the energy-efficient model will usually make up for its higher purchase price. The question, then, is how to figure out which model will cost you less in the long run.

The worksheet shows you how to use the EnergyGuide label to decide whether you are better off buying a model with a higher purchase price but lower annual energy cost. For example, you can use the worksheet to compare the two refrigerator-freezers whose labels and prices are provided.

First, you need to fill in the answers to the questions on the top half of the worksheet.

1. Are the appliances comparable in size and features? As you recall, to find the capacity of the model, look just above the word "EnergyGuide" on the left hand side of the label. The refrigerators in this example are both about 17 cubic feet, and the features given on the top right side of the labels are the same, so the answer to the first question is "yes."
2. What is the purchase price of the energy-efficient model? What is the price of the standard model? The energy-efficient model is the one with the lower yearly energy cost (or, in the case of air conditioners, the higher energy efficiency rating). As you can see the label on Model A shows an average yearly cost of \$51; the label on Model B, a cost of \$70. In this example, therefore, Model A is the more energy-efficient appliance, and Model B is the standard model. Now look at the price tags of the two refrigerators. The energy-efficient model is priced at \$545 and the standard model at \$485. Which, then, has the conventional cost?
3. How often will you use the product? This question does not apply to refrigerators, freezers, and water heaters, which run continuously. However, you will need to answer this question for clothes washers, dishwashers, and room air conditioners, since these are appliances that some people use often but others use seldom.
4. What is your local energy rate? Assume, for this example, that your local electricity rate is 5.4¢/KWh. Because the grid on the label gives costs in intervals of 2¢, you will need to round off the rate--in this case, to 6¢/KWh.

How much will each model cost you to run annually, based on your local energy rate? If you look at 6¢/KWh on the cost grids in Figure 7, you can see that the

standard model will cost you approximately \$85 per year and the energy-efficient model will cost you approximately \$62 per year to run.

5. How long do you expect to keep the appliance? The average life of a refrigerator-freezer is approximately 15 years as shown in the table below. However, assume for this example that you will move in 10 years and leave the appliance behind.

AVERAGE LIFE EXPECTANCY OF NEW APPLIANCES

APPLIANCE	EXPECTED LIFETIME (YEARS)
Refrigerators and refrigerator-freezers	15
Freezers	18-20
Dishwashers	11
Clothes washers	11
Water heaters	10-12
Room air conditioners	12-15
Furnaces	20

Source: Based on averages from Home Economics Research, March 1975, p. 169, and Department of Energy estimates.

Once you have answered these five questions, you can figure out whether you are better off buying the more energy efficient appliance by performing the calculations on the bottom half of the worksheet.

In summary, you can use the energy cost information on the label to determine:

which appliance costs less to run.
whether you are better off buying an appliance with a higher initial purchase price but lower annual energy cost.

MODEL A
Cost: \$545.00

Refrigerator-Freezer
Capacity: 17 Cubic Feet

(Name of Corporation)
Model(s) F117, F317
Type of Defrost: Full Automatic

ENERGYGUIDE

Estimates on the scale are based
on a national average electric
rate of 4.97¢ per kilowatt hour

Only models with 16.5 to 18.4
cubic feet are compared
in the scale

Model with
lowest
energy cost
\$50

\$51

THIS MODEL

Model with
highest
energy cost
\$88

Estimated yearly energy cost

Your cost will vary depending on your local energy rate and how you use
the product. This energy cost is based on U.S. Government standard tests.

How much will this model cost you to run yearly?

Yearly cost	
Estimated yearly \$ cost shown below	
Cost per kilowatt hour	2¢ \$21
	4¢ \$41
	6¢ \$62
	8¢ \$82
	10¢ \$103
	12¢ \$124

Ask your salesperson or local utility for the energy rate (cost per kilowatt hour) in your area.

Important Removal of this label before consumer purchase is a violation of federal law (42 U.S.C. 6302)

(Part No. 371026)

MODEL B
Cost: \$485.00

Refrigerator-Freezer
Capacity: 17 Cubic Feet

(Name of Corporation)
Model(s) AH503, AH504, AH507
Type of Defrost: Full Automatic

ENERGYGUIDE

Estimates on the scale are based
on a national average electric
rate of 4.97¢ per kilowatt hour

Only models with 16.5 to 18.4
cubic feet are compared
in the scale

Model with
lowest
energy cost
\$50

\$70

THIS MODEL

Model with
highest
energy cost
\$88

Estimated yearly energy cost

Your cost will vary depending on your local energy rate and how
you use the product. This energy cost is based on U.S. Government standard tests.

How much will this model cost you to run yearly?

Yearly cost	
Estimated yearly \$ cost shown below	
Cost per kilowatt hour	2¢ \$28
	4¢ \$57
	6¢ \$85
	8¢ \$113
	10¢ \$142
	12¢ \$170

Ask your salesperson or local utility for the energy rate (cost per kilowatt hour) in your area.

Important Removal of this label before consumer purchase is a violation of federal law (42 U.S.C. 6302)

(Part No. 371026)

ENERGYGUIDE WORKSHEET

1. Are the appliances comparable in size and features? _____
2. What is the price of the energy-efficient model? _____
(model with lower yearly energy cost or higher energy efficiency rating)

What is the price of the standard model? _____
(model with higher yearly energy cost or lower energy efficiency rating)
3. How often will you use the product? _____
(Refrigerators, freezers, and water heaters run continuously)
4. What is your local energy rate? _____ c/KWH _____ c/therm

How much will each model cost you to run yearly, based on your local energy rate? (see grid)

Energy-efficient model \$85 Standard model \$62

5. How long do you expect to keep the appliance? _____

Then you can figure out whether you are better off buying the more energy-efficient appliance

First, calculate the price difference:

Cost of energy-efficient model:	\$ _____
<u>Minus</u> cost of standard model:	- _____
<u>Price difference</u>	\$ _____

Second, estimate your annual energy-cost savings with the more energy-efficient model:

Annual energy cost of standard model:	\$ _____
<u>Minus</u> annual energy cost of energy-efficient model:	-\$ _____
<u>Annual energy cost savings:</u>	\$ _____

Third, calculate your energy-cost savings over the life of the appliance:

Annual energy-cost savings:	\$ _____
<u>Multiplied</u> by years you expect to keep the appliance:	X _____
	\$ _____
<u>Minus</u> price difference:	- _____
<u>Energy-cost savings over life of appliance:</u>	\$ _____

Finally, figure out how soon you can expect to recover your investment: Price difference: _____

<u>Divided</u> by annual energy-cost savings:	- _____
---	---------

<u>Years to recover investment:</u>	_____
-------------------------------------	-------

KEY
ENERGYGUIDE WORKSHEET

1. Are the appliances comparable in size and features? yes
2. What is the price of the energy-efficient model? \$545
(model with lower yearly energy cost or higher energy efficiency rating)

What is the price of the standard model? \$485
(model with higher yearly energy cost or lower energy efficiency rating)

3. How often will you use the product? Continuously
(Refrigerators, freezers, and water heaters run continuously)

4. What is your local energy rate? 6 c/KWH c/therm

How much will each model cost you to run yearly, based on your local energy rate? (see grid)

Energy-efficient model \$85 \$62

5. How long do you expect to keep the appliance? 15 years

Then you can figure out whether you are better off buying the more energy-efficient appliance

First, calculate the price difference:

Cost of energy-efficient model:	\$ 545
Minus cost of standard model:	-\$ 485
<u>Price difference</u>	<u>\$ 60</u>

Second, estimate your annual energy-cost savings with the more energy-efficient model:

Annual energy cost of standard model:	\$ 85
Minus annual energy cost of energy-efficient model:	-\$ 62
<u>Annual energy cost savings:</u>	<u>\$ 23</u>

Third, calculate your energy-cost savings over the life of the appliance:

Annual energy-cost savings:	\$ 23
<u>Multiplied by years you expect to keep the appliance:</u>	X 15
	\$ 345
Minus price difference:	-\$ 60
<u>Energy-cost savings over life of appliance:</u>	<u>\$ 285</u>

Finally, figure out how soon you can expect to recover your investment: Price difference:

<u>Divided by annual energy-cost savings:</u>	<u>\$ 60</u>
	-\$ 23

Years to recover investment: 2.6 years

The Great Battle of Gas Miser vs. Gas Guzzler
(Or: How to Determine Your Car's MPG Rating)

These are the steps used to figure out your car's/truck's gas mileage to see if your automobile is a gas "guzzler" or a gas "mizer." (Refer to the Computation Form to help make these steps easier to understand.)

1. Record your starting mileage before the week begins on the line for odometer reading #1 under Baseline Week.
2. Record the number of miles driven during the Baseline Week on the line labeled odometer reading #2.
3. Get a refill of gas in your care after the Baseline Week is over and before the Conservation week begins. Record the number of gallons put into the gas tank on line marked "no. of gallons." - Baseline Week.
4. Subtract the odometer reading #1 from odometer reading #2 and enter this number on the line labeled "miles traveled."
5. Divide the "miles traveled" by the "number of gallons" used to travel that far. This gives you the miles travelled.
6. Follow the same procedure for the Conservation week and then complete Step 3 to determine savings.

During the Conservation week follow the Family-Energy Saving tips for transportation to see if you can increase your car's MPG.

COMPUTATION FORM

(Use a separate form for each car involved in the project)

STEP 1: THE BASELINE WEEK

COMPUTING MILES TRAVELED

Odometer reading #2 - Odometer reading #1 = Miles traveled

COMPUTING MILES PER GALLON

Miles traveled ÷ Total gallons of gas used (add together all fill-ups under A, B, C and D) = Miles per gallon

STEP 2: THE CONSERVATION WEEK

COMPUTING MILES TRAVELED

Odometer reading #3 - Odometer reading #2 = Miles traveled

COMPUTING MILES PER GALLON

Miles traveled ÷ Total gallons of gas used (add together all fill-ups under E, F, G and H) = Miles per gallon

STEP 3: SAVINGS

COMPUTING SAVINGS IN MILES TRAVELED

Miles traveled first week - Miles traveled second week = Savings in miles traveled

COMPUTING INCREASE IN MILES PER GALLON (MPG)

mpg 2nd week - mpg 1st week = Increase in mpg

Discussion Questions:

Congratulations, if your computations indicate a savings in miles traveled and/or an increase in miles per gallon. If things stayed pretty much the same during the two weeks, or if they got worse during the second week of the project, can you think of any reasons why this occurred? Some things you might consider are:

Family was already energy-conscious--no room for improvement.
Family took a long trip during the second week.
It was your parents' turn to drive for the carpool during the second week.

Keep in mind that, if you had a savings, it could have been that things of this type were operating in your favor.

Use a separate sheet of paper to answer the following questions:

1. Regardless of your results, write a short paragraph describing any unusual circumstances which may have affected the outcome.
2. If you were successful in reducing miles traveled and/or increasing miles per gallon, specify which conservation effort you feel is responsible for this result.
3. Were there any major changes in your family's lifestyle during the conservation week? (For instance, your parents joined a carpool; or you walked, rather than drove, to school, etc.) Please describe.
4. Based on current gasoline prices, compute the cost of the gasoline used during the baseline week and the conservation week. These amounts can be multiplied by 52 to find out yearly costs with and without conservation.
5. Check the owner's manual in your car to determine vehicle weight, number of cylinders and size of engine (cubic inches). Also, make a note of any optional equipment the car has. How do you think these factors affected your conservation attempts?
6. Does your family plan to continue any of the conservation practices initiated during the second week of the project? If so, which ones?
7. Which conservation practices will not be continued, and why not?

Source: "Iowa-Developed Energy Activity Sampler, Home Economics,"
Iowa Energy Policy Council.

Trip Log

Keep this trip log in the car and make a record each time you take the car out on the road. You will need one of these forms for each car involved in the project.

[illegible]

Source: "Iowa Developed Energy Activity Sampler, Home Economics",
Iowa Energy Policy Council.

STUDENT WORKSHEET

Name _____

Carpooling Cost Estimates

1. Multiply cost per mile x miles per day:

_____ x _____ = \$ _____

2. Add daily parking cost

+ _____

Daily cost TOTAL:

\$ _____

3. Multiply daily cost
-
- by number of school (working)
-
- days per month

x _____

Lone driver's monthly cost TOTAL:

\$ _____

4. Divide monthly cost of driving
-
- alone by number of people
-
- in carpool

÷ _____

5. New cost per person by
-
- carpooling

\$ _____

6. Monthly carpool savings, #3 - #5

\$ _____ - \$ _____ = \$ _____

7. What other differences (besides personal savings)
-
- might carpooling make in your life?

Source: "Iowa Developed Energy Activity Sampler, Home Economics,"
Iowa Energy Policy Council

FAMILY ENERGY-SAVING TIPS FOR TRANSPORTATION

Below are some of the possible ways your family can save transportation energy. Place a check next to each item that you try during the conservation week.

DEVELOP ENERGY-SAVING DRIVING HABITS

- DRIVE MODERATE SPEEDS. As your speed increases, so does your car's wind resistance--a big factor in gasoline mileage. Most automobiles get about 21% more miles per gallon on the highway at 55 mph than they do at 70 mph.
- ACCELERATE SMOOTHLY AND MODERATELY. Avoid "jack rabbit" starts; build your speed slowly. You'll not only save gasoline, but also save wear on engine and tires.
- DRIVE AT A STEADY PACE. Frequently check the traffic situation ahead of you and adjust your driving accordingly to avoid unnecessary accelerations and decelerations. On the highway, repeatedly varying the speed by 5 mph can reduce gas mileage by as much as 1.3 miles per gallon.
- MINIMIZE BRAKING. Anticipate speed changes and take your foot off the accelerator as soon as you see a red light or slowed traffic ahead. Don't tailgate; this necessitates additional braking too.
- DON'T LET YOUR ENGINE IDLE FOR MORE THAN A MINUTE. Turn the engine off. It takes less gasoline to restart the car than it takes to let it idle. Generally, there is no need to press the accelerator down to restart a warm engine.
- SAVE GAS WHEN CHANGING GEARS. If you drive a car with a manual transmission, go through the lower gears gently and quickly for minimum gas consumption; then build up speed in high gear. If you drive a car with an automatic transmission, apply enough gas pedal pressure to get the car rolling; then, let up slightly on the pedal to ease the automatic transmission into high range as soon as possible. More gas is consumed in the lower gears.
- USE CAR AIR-CONDITIONERS AND OTHER POWER-DRAINING ACCESSORIES SPARINGLY. The cooling equipment reduces fuel economy by about 10% on the highway and up to almost 20% in stop-and-go traffic.
- DON'T PUMP THE ACCELERATOR OR RACE THE ENGINE WHEN YOUR CAR ISN'T IN MOTION. It wastes gasoline. Use the brake pedal rather than the accelerator to hold your car in place on a hill.

DRIVE LESS - PLAN YOUR TRIPS

- USE THE CAR ONLY FOR ESSENTIAL TRIPS. If you're not old enough to drive, don't ask your parents (or older brothers and sisters) to take you places unless it's really important.
- USE MASS TRANSPORTATION, WALK OR RIDE YOUR BICYCLE. Consider walking or using your bicycle when you want to visit friends in your neighborhood. If your mother needs something from a local store, offer to make the trip for her on your bicycle.
- ENCOURAGE YOUR PARENTS TO JOIN A CAR POOL. About one-third of all private automobile mileage is for commuting to and from work. If you and several of your friends are going to a party or a ball game, try to work out a car pool.
- THINK ECONOMICALLY. If you have more than one car in your family, use the one that consumes the least amount of gas whenever practical.
- CONSOLIDATE ERRANDS. Errands and short trips are costly in terms of gas mileage. Try to take one less short trip per week by doing several errands in one trip or combining your trips with those of friends and neighbors. A vehicle started cold and driven 4 miles may average 8 MPG. However, don't idle the engine to warm it (a wasteful practice). Instead, drive slowly the first few blocks.
- PLAN YOUR ROUTE. Consider which route will require the least fuel. Allow for the fact that freeway driving is nearly twice as economical as driving in heavy city traffic.

CAR MAINTENANCE

- HAVE YOUR CAR TUNED AS RECOMMENDED BY THE MANUFACTURER. Regular tune-ups extend engine life and improve performance. A poorly tuned car could use as much as 3 to 9% more gasoline than a well-tuned one. The tune-up will pay for itself in gasoline savings and car reliability.
- CHECK TIRE PRESSURES AT LEAST ONCE A MONTH. Underinflated tires increase gas use. You can lose about 2% in fuel economy for every pound of pressure under the recommended pounds-per-square-inch. The most accurate readings can be taken when the tires are cold.
- CONSIDER RADIAL TIRES. They can mean from 3 to 5% improvement in gas mileage in the city, 7% on the highway, and 10% at 55 mph after the tires are warmed up for 20 minutes. Their initial high cost is usually paid for in fuel savings and longer tread life. Never mix radials with conventional tires.
- DON'T CARRY UNNECESSARY WEIGHT. The lighter the car, the less gas it uses. An extra 100 pounds decreases fuel economy by about 1% for the

average car, 14% for small cars. Also, remove luggage and ski racks when not in use. At highway speeds (about 40 mph) air resistance becomes a major factor in mileage.

— MAKE SURE YOUR WHEELS ARE PROPERLY ALIGNED. An annual check is in order. Improper front wheel toe-in alignment can increase fuel use by 0.3 mpg.

— MAKE SURE YOUR BRAKES ARE ADJUSTED CORRECTLY. Dragging brakes can rob gasoline economy. Be sure they are releasing properly.

— BUY GAS ONLY WHEN THE GAUGE SHOWS A QUARTER TANK OR LESS. The practice of keeping tanks nearly full at all times is wasteful. Each fill-up introduces the possibility of spillage. The higher gas tank weight also adversely affects mileage.

— CHANGE OIL AND OIL FILTER AT RECOMMENDED INTERVALS. Dirty oil can seriously damage engine parts and cause friction and wear that rob gas mileage. A worn engine that burns oil will require more frequent tuning and get progressively poorer gas mileage.

— USE A GOOD QUALITY MULTI-GRADE (MULTI-VISCOSITY) OIL HAVING AN API SAE RATING ON THE CONTAINER. Multi-grade 10W-30 and 10W-40 oils help reduce internal engine friction and give better gasoline mileage than single grade SAE 30 oils. Do not use an oil of higher viscosity than recommended in your owner's manual since heavier oils tend to increase friction and decrease efficiency.

— LOOK FOR SIGNS THAT YOUR CAR IS OUT OF TUNE. Your car is improperly tuned if it idles too fast; the engine races and the car tends to creep; the engine misses or sputters; there is black, smutty residue in the end of the exhaust pipe, a wet drip from the exhaust, or black smoke, the engine is hard to start and staggers on acceleration.

— REMOVE EXCESS ICE AND DIRT FROM YOUR CAR IN THE WINTER. Dirt and ice increase wind resistance.

CHOOSING YOUR NEXT CAR

— STUDY THE MARKET BEFORE YOU BUY. Obtain a free copy of the latest "EPA/FEA Gas Mileage Guide" by writing to Fuel Economy, Pueblo, Colorado 81009. Also, review mileage test results publicized by Consumers Union and car magazines. Generally, the best fuel economy is associated with low vehicle weight, small engines, manual transmissions, low axle ratio and low frontal area (the width of the car times its height).

— OVERDRIVE OPTIONS AND CRUISE CONTROL CAN SAVE UP TO 15% ON FUEL AT HIGHWAY SPEEDS. These are good choices on a new car.

APPENDIX C

TEACHER BACKGROUND INFORMATION

TEACHER BACKGROUND MATERIAL

I. Per Capita Use of Energy

Compare the amount of energy used in 1955 and the amount projected for 1985. Point out that in 30 years the amount of energy needed will increase 2 1/2 times. Point out that the population will only increase by 20 percent. Ask the following questions:

Why is more energy required?

What should be done about the amount of energy being used? (Answer: Decrease energy use.) How is this going to affect family lifestyles in the future?

II. Population Growth

Explain that the 20-35 age group influences economic activity much more than any other age group. It is during this period that marriage and the establishment of a household and a family occurs. Have students make observations (oral or written) of how the growth of the family influences the purchase and use of household items that require the use of energy. How does this relate to budgets?

III. Changes in GSU Fuel Sources To Produce Electricity

Explain that these are the fuels that have been and will be used to produce electricity during 1970-1990. Ask the following questions:

- (i) What fuel sources were being (or will be) used most often in 1970? 1976? 1984? 1986?
- (ii) What is happening to the use of gas and petroleum? Explain that because of dwindling supplies and increased costs, less and less petroleum will be used. Explain that government regulations prohibit the building of any new power plants which use natural gas to produce electricity. Natural gas has important uses other than as a boiler fuel.
- (iii) When will GSU start using coal to produce electricity?
- (iv) When will nuclear be used? Explain that coal and nuclear will increasingly take the place of oil and natural gas as fuels for generating electricity.

Growth of U.S. Energy Use and Population

Note that energy use and population growth increased at the same rate from 1850 to 1890. Rapid industrialization is the reason usually given for rise in energy use from 1890 to 1930. Depression years correlate with decreasing

energy use. War reversed that trend. After the war, proliferation of consumer goods (cars, highways, homes, urban sprawl, etc.) were part of an energy binge that showed no sign of slackening until the late 1970's.

GLOSSARY

GLOSSARY

Active solar system - a space or hot water heating system that depends on energy-consuming equipment (pumps, blowers, electric controls, automatic tracking devices, etc.) to collect or to move the solar heat.

Air conditioning - the process of treating air to control its temperature, humidity, cleanliness, and distribution within a particular space.

Air conditioning filter - material usually made of fiberglass or foam rubber used to collect dust, dirt, grease and other particles and to prevent them from entering mechanical heating and cooling equipment.

Air Exchanges - uncontrolled movement of a volume of air in or out of a room or an entire building over a period of time. Air exchanges (AE) are sometimes expressed as whole-volume exchanges per hour or, alternatively, as cubic feet per minute (CFM). A standard, insulated new home is expected to have 1 AE/hour; a specially constructed, energy-efficient house may have only 1/2 AE/hour. Drafty, uninsulated houses typically have 2 - 4 AE/hour.

Air pollution - a level of concentration of foreign materials in the air that unfavorably affects the life and health of air breathing plants and animals (especially humankind) and/or affects property adversely.

Appliance - any device meant for a specific use, but especially those requiring commercial power input for operation. Common household appliances include refrigerators, stoves, toasters, dishwashers, mixers, irons, washers and dryers, television, and stereo sets.

Atomic energy - energy obtained from disturbances within the nucleus of the atom. The resulting disintegration of matter into energy may be spontaneous (as in natural radioactivity) or it may be induced artificially (as in nuclear fission for production of electricity and in uncontrolled fusion for the firepower of hydrogen bombs).

Attic ventilation - system used to remove heat and moisture from the attic. Example: wind turbines and eave vents without ventilation, heat build up may become excessive. At night, heat may continue to radiate into the rooms or space below. Ventilation is also required to remove damaging moisture from the attic.

Types include:

1. Wind turbines
2. Continuous ridge and soffit vents
3. Gables
4. Power vents

Barrel - a liquid volume equal to 42 gallons or 159 liters. One barrel of crude oil has about the same heat energy as 350 pounds of bituminous coal.

Blackout - a shutoff of all electrical power in a given area. It can be caused by storm damage, equipment failure, or overloaded circuits because of unusually heavy consumer use.

Brownout - the deliberate reduction of power to users of electric utilities whenever demand for power exceeds generating capacity. During a brownout, lights will dim and fans run more slowly. Some appliances stop running altogether.

B.T.U. (British Thermal Unit) - the amount of heat energy required to raise the temperature of one pound of water one degree Fahrenheit. One BTU is approximately equal to the amount of heat given off by a wooden match. A pound of coal contains approximately 13,000 BTU of chemical energy.

Calorie - the amount of heat required to raise the temperature of one ml of water one degree Celsius; a metric unit of heat energy.

Capacity - the maximum load for which a generator, transmission circuit, power plant, or system is designed.

Caulking - a soft, semi-solid material that can be squeezed into non-movable joints and cracks of a building, thereby reducing the flow of air in and out of the building.

Coal - solid fuel formed by the decomposition of plants buried deep under Earth's surface. A whole group of naturally occurring, carbon and hydrogen-rich rocks are called "coal". Various types are ranked by the percentage of carbon in dried samples or by the calorie value of moist ones. Age and depth of burial contributed to differential changes in the original plant debris. The concentration of carbon increased over time (hundreds of millions of years) as trapped moisture and gases eventually escaped and pressure forced changes in the organic remainder.

The chemical composition of coal varies widely. It is not homogeneous and regional differences, reflecting both variations in its history of formation and the kinds of plants involved, are common. However, gross distinctions can be made. From least to most carbon-rich, the coal group includes peat, lignite, sub-bituminous and bituminous coals, and anthracite.

Comfort zone - the ranges of indoor temperatures, humidity, and air movement under which most people enjoy a feeling of well-being.

Condensation - the change in state from a gas to a liquid, releasing energy.

Conduction - the flow of heat from a warm material to a cooler one in direct contact with it; the transmission of energy directly from molecule to molecule.

Conservation - making the best use of natural resources by reducing waste, improving efficiency, and slowing the rate of consumption.

Convection - transfer of heat energy by the movement of currents of a liquid or a gas.

Curtailment - cutting back the use of energy resources as opposed to conserving or wisely using resources.

Damper - a device used to vary or stop the volume of air passing through an air inlet, outlet, or duct, such as a fireplace.

Deciduous trees - trees which lose their leaves in the winter. They allow the sun in during the winter but keep the sun out during the summer.

Degree-day - the difference between 65° and the daily temperature. For example, if the low temperature for Friday was 12°F and the high for the day was 28°F, the number of degree-days for the day was

$$(65^{\circ}\text{F} - \frac{28 + 12^{\circ}\text{F}}{2}) = (65^{\circ}\text{F} - 20^{\circ}\text{F}) = 45$$

The greater the number of degree-days in a particular area, the higher the energy consumption for heating and cooling is likely to be.

Ductwork - if your home has central cooling and/or heating, it will have ductwork. Ductwork is the air delivery system to the rooms. It is most commonly found in the attic or in the furred down (low) areas of the ceiling.

E.E.R. (energy efficiency ratio) - rating used to help the consumer determine and compare the operating costs of heating and cooling equipment. E.E.R. indicates how completely an electrical appliance converts energy at the point of use. The rating is derived by comparing heating or cooling power (output) to energy consumed (input). The higher the rating, the more energy-efficient the equipment (Example E.E.R. of 9.0 would cost less to operate than E.E.R. of 6.5).

$$\frac{\text{BTU per hour (cooling capacity)}}{\text{watts (electrical consumption)}}$$

Efficiency - the ratio of useful work or energy output to total work or energy input. One hundred percent energy efficiency is impossible. There is always a cost or "handling charge" in any energy conversion. In addition, some forms of concentrated energy and some energy-consuming systems provide much more energy than is needed to do a particular task. For example, using a 350 horsepower car to transport one healthy person two miles to a swimming pool or gym for exercise is a highly inefficient use of both the driver and the car. A bicycle would be more efficient according to the standard pioneered by the American Physical Society: "thermodynamic efficiency is the ratio of the least available work that could perform the task to the available work actually consumed in doing the job with a given device or system."

Electric meter - device that measures electricity in kilowatt-hours and has either dials or numbers for recording the amount used.

Energy - the ability to produce motion against resistance (work); or, whatever heats, lights, moves, or changes matter.

Energy audit - the examination of a building's construction and materials, mechanical and electrical systems, energy usage patterns, in order to identify possibilities for energy conservation.

Evaporation - the change from liquid to gas which requires extraordinary absorption of heat by the material undergoing this phase change. Liquid water, for example, absorbs 540 extra calories per gram at 100°C as it vaporizes. This heat will be released again if the water vapor condenses.

Evergreen trees - trees that keep foliage all winter. Coniferous trees are evergreens which make especially good windbreaks.

Fiberglass - a material made of extremely fine filaments of glass which are used in masses as insulation.

Flourescent lamp - a lighting device in which light is produced by the passage of electricity through a metallic gas enclosed in a tube. Flourescent bulbs provide about four times as much illumination per watt as incandescent ones do; they give off about 75% less heat; they cost more initially but they last approximately seven times longer than incandescents; and they include types that can be used in existing incandescent fixtures.

Foot candles - the unit of direct illumination at a given location, equivalent to the energy of light received on a surface at a distance of one foot from a standard candle. It is equal to one lumen per square foot.

Forced air - a common type of heating system in which air heated in a furnace is then blower-driven or "forced" through ducts to all areas of the building. The primary fuel may be coal, fuel oil, natural gas, or wood, but electricity is also needed to power the blower and thermostat.

Fossil fuel - any naturally occurring underground fuel formed by decomposition and/or metamorphosis of the remains of ancient life forms. Coal, crude oil, and natural gas are fossil fuels.

Fuel - any substance used to provide heat energy.

Gasket - rubber, plastic, or metal band used around the door frames of appliances and cars to form a tight seal, reducing energy losses by infiltration.

Geothermal energy - heat trapped in the interior of the Earth is called geothermal energy. Boreholes into the crust show an average temperature increase of 1°C for every 30 meters depth, or about 100°F per mile. Geothermal heat is believed to come from the decay of radioactive materials deep in the Earth as well as some from friction of rock movements, tidal forces, and perhaps other sources. This heat keeps great quantities of buried rock molten and hot. Some of this energy escapes at the surface as hot water. Geothermal energy is available in four forms; dry steam, wet steam, hot rocks, and geopressured hot water.

Greenhouse effect - the warming effect of carbon dioxide and water in the atmosphere acting as a "lid" to slow the escape of heat from the Earth's surface. Molecules of water and carbon dioxide absorb and reradiate back to Earth much of the heat radiated from it.

Heat gain - the amount of heat provided to an enclosed space from all sources, including people, lights, appliances, sunshine, and furnace; a figure used to estimate the size and performance of heating and air conditioning system.

Heat loss - a decrease in the amount of heat contained within an enclosed space, resulting from heat flow through walls, windows, roof, and other building components.

Heat pump - a device that transfers heat from a cooler region to a warmer one (or vice versa) by the expenditure of mechanical or electrical energy. The heat pump operates by alternately evaporating and condensing a refrigerant, or heat transferring fluid, in a closed cycle. It differs from a typical refrigeration unit in that the heat pump can reverse its cycle to provide heat instead of removing it. Heat pumps are both heaters and air-conditioners and, compared to electric resistance elements often used in all-electric homes, they are more efficient.

Hydroelectric plant - an electric power plant in which the turbine-generators are driven by falling water.

Incandescent light - a common lighting device containing a solid filament that glows when electric current is passed through it. The filament's resistance to the current makes it glow with heat. The output of an ordinary incandescent bulb is about 95% heat.

Infiltration - the natural process by which air leaks into or out of a building, especially through cracks around doors, windows, vents, electrical outlets, and any other small openings or breaks in the exterior surface. Wind, significant temperature differences between the interior and exterior, lack of caulking and weatherstripping, numerous windows and vents, and inadequate insulation all contribute to high rates of infiltration.

Insulation - material used in home construction to retard (slow down) the heat loss from a home in the winter and heat gain in summer. Some commonly used materials are fiberglass, cellulose, mineral or rock wool, and styrofoam.

Intermediate peak period - 10 a.m. to 2 p.m. and 6 p.m. to 10 p.m. in GSU service area. A period of moderate use of electricity.

KWH - (kilowatt-hour) - the amount of energy equal to 1000 watts of electricity used for one hour. (Example: Ten 100-watt light bulbs burning for one hour.)

Life cycle cost - the total cost of an article over its entire useful life, including operating, maintenance, and financing expenses in addition to the purchase price.

Megawatt - a unit of power equal to 1,000 kilowatts or 1,000,000 watts. It is usually used to describe the capacity of power plants.

Natural gas - mixture of gaseous hydrocarbons occurring naturally in certain rocks. There are several kinds of gas trapped in porous rocks underground. One of these "natural gases" is methane, used as a commercial fuel. Petroleum deposits always include some methane, but natural gas deposits are not always accompanied by petroleum. Natural gas is commonly sold to individuals in hundreds of cubic feet (Ccf), the unit appearing on household utility bills. One Ccf of commercial methane has about 25,000 Calories, the equivalent of 8 pounds of coal or 0.7 gallons of crude oil.

Natural gas meter - device that has dials like the electric meter, but measures gas consumption in hundreds of cubic feet.

Non-renewable resources - energy resources that are not being replaced during human history. Examples are coal, oil, natural gas, and uranium.

Nuclear power plant - a generating station that converts nuclear energy into some form of useful power, such as mechanical or electrical power. In a nuclear power plant, heat produced by a reactor is generally used to make steam to drive a turbine that, in turn, drives an electric generator.

Nuclear reaction - a change in an atomic nucleus due to fission, fusion, neutron capture, or radioactive decay, as distinguished from a chemical reaction which is limited to changes in electron structure surrounding the nucleus.

Off-peak period - when demand for electricity is the least. 10 p.m. to 10 a.m. on weekdays and all weekend in GSU service area. (On weekends, industries do not need as much electricity and businesses are closed.)

Overhang - a solid horizontal projection on the exterior of a building placed (ideally) so that it shades southern windows in summer only. An overhang may be fixed or movable, part of the original construction or a retrofit. Several designs are possible. An upward-tilted overhang can also serve as a reflector in winter.

Passive solar system - Building design, materials, and equipment that together deliver 50 times more heat to the interior of a building than does the non-renewable supplementary energy it uses. Passive systems rely on natural energy flows, collection, and storage with a minimum of mechanical aids and a minimal use of fossil fuels.

Payback period - the amount of time it takes for an energy-saving improvement to pay for itself through savings on the utility bill. If adding R-30 insulation to a home with R-0 insulation costs \$500 and you save \$250 a year on your utility bill, it would pay for itself in 2 years.

\$500 (cost for insulation)
\$250 (yearly savings)

Peak period - Time of day when the greatest demand for electricity occurs (2 - 6 p.m., Monday through Friday).

Petroleum - a naturally occurring, oily, dark-colored liquid mixture of hydrocarbons. Refineries distill this raw material into gasoline, kerosene, diesel fuel, lubricating oil, waxes, and other products.

R-Value - the resistance to heat flow. The higher the R-value, the greater the insulating efficiency of the material. Thickness is a factor also, so R-values are commonly stated per inch of building material. R-values are additive--thicker material or a combination of materials means increased resistance to heat flow. Some typical R-values per inch of material are 6.25 for polyurethane foam; 3.17 for fiberglass batts; 1.25 for fir and pine wood; 0.18 for plaster; and 0.08 for concrete.

Radiation - emission and propagation of energy through space; pure energy that travels rapidly until striking materials that can absorb it. Then absorbed radiation will either induce a chemical change (as in photosynthesis, sun tanning, photography, photovoltaic cells) or increase the random motion of the molecules of the material contributing to its temperature. Examples of bodies emitting radiation are the sun, electric lights, human beings, waters and cements that are warmer than their surroundings, Franklin stoves, and radioactive materials.

Reclamation - Process of replacing the soil, clay, and rocks removed earlier to expose coal or oil shale for strip mining; compacting and leveling the site; and replanting it to restore its appearance and reduce erosion and drainage of waste materials.

Renewable resources - materials that are recycled by natural processes within a relatively brief span of time (a human lifetime). Fresh water, wind, sunshine, and trees are some examples of resources that seem to renew themselves within human time frames.

Retrofit - add energy-saving features to an existing home.

Site orientation - the relationship of a home's or building's position to prevailing winds, sun, vegetation, and other buildings, which can affect the heat loss or heat gain performance of the home or building. Example: locating a home so that most of the windows are facing north and south in order to minimize heat gain in the summer.

Solar cell - a thin sheet of semi-metallic material (usually silicon) which can convert energy from the Sun directly into electricity. An individual cell on the retail market in 1980 typically produces a small potential difference of about 0.5 volts and about 0.6 watts of power. An array of solar cells can provide a useful electrical capacity.

Solar collector - a device which collects the Sun's energy as heat. They are made in many shapes and styles: flat-plate, tubular, and concentrating. Air or liquids are the fluid media usually used for heat transfer.

Solar energy - electromagnetic radiation emitted by the nearest star, the Sun. Earth receives about 4.2 quadrillion kilowatt-hours of energy per day from the Sun.

Storm window - a glass or plastic covering for a conventional window, used to provide additional protection from cold and wind. A well-sealed storm window traps an insulating layer of air between itself and the other window, decreasing heat loss due to conduction through the glass and keeping the inside pane warmer.

Strip-mining - a method of mining coal that lies less than 110 feet below the surface. Overburden (soil, clay, and rock, above the fuel) is scraped away by huge mechanical shovels and stored, layer by layer, in separate piles. The coal is removed and then (ideally) layers of overburden are replaced in their former relative positions, topsoil uppermost.

Thermostat - a temperature-sensitive device which turns heating and cooling equipment on and off at set temperatures.

Ton of air conditioning - the thermal refrigeration energy required to melt one ton of ice (2,000 pounds). As a means of expressing cooling capacity, 1 ton = 12,000 BTU/hour cooling.

Vapor barrier - a material used to prevent moisture from passing through warm interior walls of a building and condensing on the cold exterior walls, thus soaking insulation and causing other problems. Plastic sheeting is often sealed against wall studs as a vapor barrier; special backing on batt and blanket insulation, foil or plastic wall coverings and special interior paints are other vapor barriers used to keep humidity inside a building.

Watt - a measure of electrical power. Wattage is a product of the voltage (measure of the "pressure" in an electrical circuit) and the amperes (current or flow of electricity). One volt and one amp applied to a circuit for one hour would use one watt-hour of electricity.

Weather stripping - foam, metal, felt, or rubber strips used to form a seal around windows, doors, vents, and other movable openings where infiltration can occur.

Wind break - a dense row of trees, or a fence or other barrier that interrupts and changes the local path of the wind.